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STUDY OF THE DEVELOPMENT OF ICT IN THE KINGDOM OF BHUTAN

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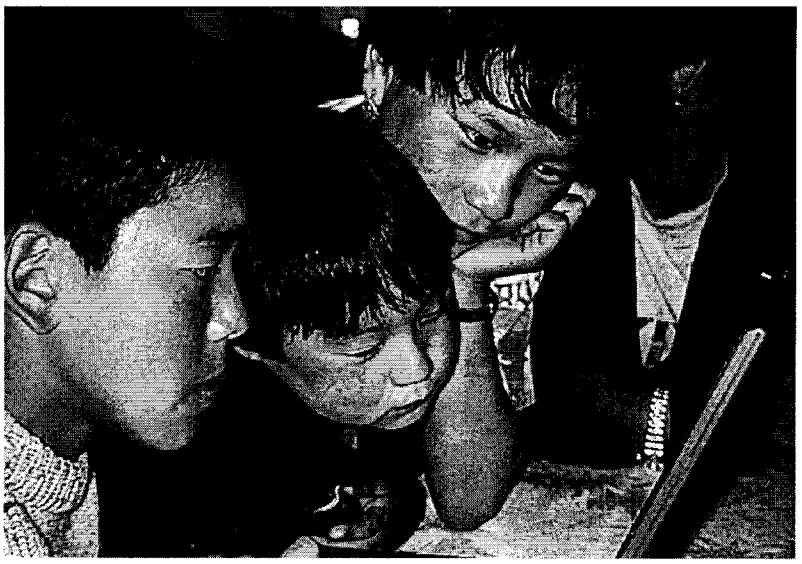

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METHOD OF STUDY

The study was carried out over a period of 3 months starting 26th of June 2001. The base office location for the study was in Druknet, Thimphu. However, due to the nature of study, frequent traveling was made to different locations in the country. These were required to discuss and find out first hand views and comments on ICT development in the country. Considerable time was spent in Jakar to make an indepth study of the Multipurpose Community Telecentre.

On-line feedback and comments survey was carried out for more than 100 Druknet customers. Survey questionnaires were distributed to more than 80 sector heads for their views and feedback on the ICT sector. Many of the answers were acquired in person. Some 'gups' or village headmen were interviewed for their comments on computers and Internet. They did not have much to contribute, as they have no idea about information and communications technologies. Most of the user surveys of the MCT facilities were done in person.

In Thimphu, I discussed individual Ministry's or organization's ICT policies and plans with high-level officials. Various meetings were conducted with donor agencies. Small group discussions were held. I had the privilege of getting access to lot of important documents and information.

In the interpretation of results, I discussed the findings with many senior officials involved in the ICT field. These interpretations therefore, will reflect a collective view.

I also had the opportunity to get valuable information and advice from the Director of BTA regarding policy issues and the future development strategies.

Most of the research study involved reviewing and analyzing Ministerial and Sectoral ICT policies. I also referred many ICT plans and strategy papers prepared by donor agencies.

CHAPTER 1 EXECUTIVE SUMMARY

"In the field of telecommunications, our future strategies must also meet multiple objectives. They must bring telecommunications as well as postal services closer to the rural population. They must facilitate communications and exchange within the nation through the development of such services as email, the Internet and 'Intranet'. They must also further improve our contacts with the outside world, making it possible for us, at an appropriate time and following the introduction of appropriate standards, to access the 'information superhighway' that will provide us with access to the same information and data as those residing in the most technologically advanced nations"

Paragraph 184, Vision 2020

The National vision statement of Bhutan also known as the "Vision 2020" is the blueprint to the country's development strategy for the next 20 years. Efficiency and productivity are two main pillars of governance. As such, strong emphasis is given to the development and enhancement of Information and Communications Technologies in the country.

After the domestic telecom project, the establishment of Druknet was a landmark event in the country's history. It brought about huge impacts on every sphere of the socio-economy. All districts have access to modern telecommunications and many district offices use computers and Internet.

The distribution of ICT systems and applications are however not evenl. Most of the schools in Bhutan do not have computers and many of the children have not even seen a computer. The Education sector is preparing for the implementation of the IT Master Plan for Education that has provisions to provide computers to all schools when resources are available.

The Health sector is one of the earliest organizations to use computers and Internet. However, resources are still not used optimally. The storage and efficient retrieval system of health information will benefit the planning process. Telemedicine is an important area for a country like Bhutan where most of its people live in very remote places. While doing so the cost implications and its sustenance in terms of maintenance and technology will need study.

Community Telecentres will be very useful in remote locations. The Jakar Telecentre is an ideal example. The promotion of computer education and Internet in schools spearheaded by Druknet in collaboration with UNDP, resulted in the training of more than 4,000 students, unemployed youths, businessmen, housewives, teachers and civil servants in just one year. Such initiatives and programmes will have to be continued.

The Ministry of Agriculture's Enterprise Network foresees interconnection of the 4 Research Centres and 20 District Offices with the Headquarters. All the Research Centres, that function as regional RNR nodes, have networks. These networks will be linked to the headquarters.

The number of ICT related businesses have risen drastically. Many of the private sector enterprises will use Internet to cut costs and increase productivity. These will create huge markets for networks and services. Tourism will tap the vast opportunities available through web advertising and marketing. Many private tour companies have hosted websites in Druknet. Inadequate human resources in th ICT sector is a great drawback for the private sector.

The telecom sector will increase its network capacities to meet the impending demands. Use of these resources has to be cost-effective. As such, sharing of resources and costs will have to be coordinated by government and non-government agencies.

At the community level, Government will promote entrepreneurship in a more aggressive manner. Many villages have telephones today. This already has great impacts on efficiency and communication. Appropriate participation in community ICT projects will help the 'geog' administrations. 'Gups' or village heads will have to be trained from basic office management to bookkeeping and computers.

Where employment is already becoming a critical issue, ICT will create employment opportunities for the Bhutanese youths. Bhutanese education system will produce more than 30,000 people for the employment market in the next 5 years. Due to the small size of the public sector and the slow pace of the private sector growth, many of them will be unemployed. Appropriate steps will have to be taken now. Initiatives on computer training and Internet, besides building capacities, will generate business and self-employment. For now, this needs sincere initiatives, policy support and donor participation.

The direction shown by the country's Vision 2020 statements will need infrastructures and tools such as telecommunications and Internet. Available ICT professionals have to be efficiently used and more people need to be trained. There is unfailing acceptance on the huge impact that Druknet brought about in the country. Bhutan's efforts will be now on reaching ICT to the most needy of the societies, its people so that every level of the Bhutanese society and the country itself will reap the benefits of ICT.

CHAPTER 2 COUNTRY PROFILE

History

It is indicated that the Kingdom of Bhutan was inhabited as early as 2000-1500 B.C. However, not much is known of the period before the 7th century. Bhutan has always remained an independent country throughout its history. During the 17th century Shabdrung Ngawang Namgyel (1594 - 1652) unified the country into one state and rule. He established theocracy in 1652 and gave Bhutan its first administrative system and a code of law. This theocracy established by Shabdrung ended in 1907 when Ugyen Wangchuck (1862 – 1926) was elected as the first hereditary King of Bhutan by popular consensus of the people and clergy. There have been four hereditary kings since then. Until 1960s, Bhutan remained an isolated country. The third King Jigme Dorji Wangchuck opened links with other countries and initiated modern planned development at the beginning of the sixties. Many social, legal and constitutional reforms were also introduced during his time.

Geographical Characteristics

Bhutan is a mountainous country in the middle of the eastern Himalayas. It covers an approximate area of 46,500 square kilometers. It is bordered by the Indian states of Sikkim, West Bengal, Assam and Arunachal Pradesh in the south, east and west and by the Tibetan Autonomous region of China in the North. Bhutan's borders are prominently natural ones. The Kingdom of Bhutan is almost entirely mountainous with flat land limited to the broader valleys running north to south. Land rises from approximately 100 meters above sea level in the south to the over 7,000 meters in the utmost north. There are three major landform features; the southern foothills, the inner Himalayas and the higher Himalayas. The southern foothills rise from the plains to the height of 1,500 meters. The inner Himalayas rises gradually to about 3,000 meters and the higher Himalayas rises beyond 7,000 meters above sea level. The slopes of the mountains are covered with birch; magnolia and most commonly rhododendrons while for the many months of the years the northern summits are covered with snow. The plains and broader river valleys comprise the economic and cultural heartland of the country.

Climate

There are three distinct climatic zones. The southern belt has hot and humid climate with temperatures remaining fairly even throughout the year between 15 and 30 degrees and annual rainfall between 2,500 and 5,000 millimeters. The central inner Himalayas has cool temperate climate with annual rainfall averaging 1,000 millimeters. The higher Himalayas has a severe alpine climate with annual rainfall around 400 millimeters and tremendous amount of snow.

Institutions
Bhutan is a sovereign independent state with the King as the Head of State and the Chairman of the Council of Ministers as the Head of Government. This Chairmanship is rotated on a year basis.

There are 20 districts (dzongkhags) in Bhutan. Some of the large Dzongkhags are further divided into Dungkhags (sub-districts). A geog (Block of villages) is smallest administrative division and is composed of a number of villages headed by a Gup (Block Head) who acts as a bridge between the people and the government. The Dzongdag is the administrative head of the district.

Organization
The National Assembly, the Royal Advisory Council, the Judiciary, the Council of Ministers and the Sectoral Ministries are the organizations that play a crucial role in the governance. At all administrative levels there are established mechanisms that ensure people's participation in the decision making process. The present King has initiated the decentralization of administration with the establishment of the Dzongkhag Yargye Tshogchung (DYTs or District Development Committees) in 1981 followed by the introduction of Geog Yargye Tshogchung (GYTs or Block Development Committees) in 1991. The decentralization process has enhanced the capacity of traditional local institutions. Under the present King's wise leadership and able guidance, the strengthening of these local institutions has led to active participation and devolution of the crucial role of decision-making from the center to the people themselves at the Dzongkhag and the geog level.

Economy
Bhutan is predominantly an agrarian country, agriculture being the main subsistence occupation of a majority of the Bhutanese people. Animal husbandry also plays an integral part in the farming system. At higher altitudes, herds of yaks and sheep are kept on pastures. The GDP contribution from primary sector between 1980 and 1997 showed significant shift from a high of 57% to 40%. The decline could have been mainly contributed from agriculture, which was 56% of the GDP in 1980 but its share declined to 36% in 1997. The decline in primary sector contributed increased shares in the secondary and tertiary sectors respectively. The GDP share in these sectors increased from 44.5% in 1980 to 63.8% in 1997, a total increase of 19.3%. With agriculture encompassing about 75% of the labor force, it will continue to be the chief source of livelihood to the Bhutanese society.

Sector	Percentage of labor
Agriculture	74.9
Manufacturing	4.6
Service	11.7
Trade/Commerce	3.9
Transport	1.1
Others	3.8

Source: NEB (NLF survey)

Description	Percentage
Employer	0.3
Government	10.8
Private employees	5.2
Own account workers	27.6
Unpaid family workers	52.8
Others	3.2

Source: NEB (NLF survey)

Similar to many of the developing countries, the bulk of the labor force in Bhutan is comprised of unpaid family workers. Surprisingly, a notable number is also composed of own account workers or self-managers as well as workers.

The national per capita income stands at US$ 470 (1995). 85% of the population derives a living from agriculture and other traditional activities in the rural sector. Employment in the modern sectors of the economy is limited, apart from public services of various kinds, and small-scale trade in the urban areas. Industrial development is as yet limited and does not provide significant employment. The Government has been responsible for the establishment of several productive enterprises, but the private sector is being encouraged to take over these activities. Unlike many other developing countries, unemployment is not yet a major problem.

Telecommunication services consisting of telephone, telegraph, telex, facsimile, Internet and e-mail are available to the dzongkhag headquarters throughout the country except.

CHAPTER 3 ICT POLICY

The ICT policy objectives of Bhutan are:

- To use ICT as an integral tool to enhance good governance
- To develop ICT and its related industries to generate employment and income for the country
- To apply ICT to improve the livelihood of all Bhutanese citizens

These broad objectives drive the ICT policy of the country.

Summary of ICT Policy

ICT is recognized as a vital engine for development as this technology has demonstrated enormous power to change. Bhutan has witnessed this change during the last decade. ICT leads to better quality of life of citizens and it ensures or promotes greater freedom. The various capabilities broaden choices and support social welfare and cultural activities. Bhutan recognizes that its culture, tradition and environment are its greatest assets. It is believed that through international co-operation, ICT would promote their development and preservation.

Bridging of technology gap

Bhutan strives to give every citizen access to ICT tools. All citizens will share knowledge and experiences brought by ICT for the benefit of communities and the country at large. Partnership in ICT between private and public sectors will be encouraged.

Within a very short time frame, Bhutan has experienced a gap between the technology haves and have-nots. Efforts will be made to bridge this gap. There is a noticeable progress in the field of ICT in Bhutan. Subjects such as digital divide and convergence have increasingly been recognized by the Bhutanese society. Appropriate actions will be taken to tackle these issues.

The difference in a person's income, age, gender and in access to technologies will be addressed. All these differences will be tackled individually. ICT will be exploited to the fullest to meet this objective. Sharing of information will be promoted between all our societies through appropriate means. Coordination and sharing of information with other societies and countries will also be encouraged.

Information-based society

Bhutan will take necessary and appropriate steps to establish an information-based society in which everyone can obtain the benefits of ICT. People would also take advantage of the numerous opportunities ICT brings for the development and prosperity of the country. Necessary infrastructures will be

established to provide access to such resources as the Internet, e-commerce, telemedicine, distance education and various on-line services.

An effective way to promote the balanced development of Information and Communication Technologies infrastructure is to utilize appropriate technologies and equipment according to various Bhutanese conditions.

Public-Private sector partnership

Private sector will be highly encouraged to invest in the development of Information and Communication Technology infrastructures. Initially this incentive would start with numerous public-private partnership programmes. The Bhutanese government will create an environment that encourages this approach. Appropriate legal framework will also be established. Where necessary government will lead in promoting infrastructure development, with international support, if required. Bhutan will continually coordinate with International organizations and agencies in the field of technology standardization

Electronic Applications, rights and obligations

Various applications will be developed in order to allow ICT to provide the benefits of efficient economic and social interaction. Proper use of ICT will be encouraged to enhance efficiency through projects such as e-government. Electronic Commerce (e-commerce) will be given emphasis. This would particularly help increase business and public services including in rural areas. The quality and variety of content is also of great importance to the information society. To encourage more people to join online activities, special emphasis will be placed on the promotion of applications that are useful for local languages, such as translation as well as development and distribution of contents that reflect our cultural or linguistic characteristics. In all these development efforts, Bhutan will pay attention to the protection of intellectual property rights and social harmony of our small society.

To establish an encouraging and supportive information society, security and reliability of online systems and contents are important. Bhutan shall take special consideration of this requirement. Cyber laws will be established. Internet crimes such as hacking, computer viruses, the misuse of personal data and indecent information are serious threats and these will be contained. Sharing of information with other administrations will be encouraged to counteract such crimes. Cyber crime will be severely dealt. Bhutan shall co-operate with other countries and administrations on privacy and ethical issues.

There will be process to establish a Multimedia Act in the country that will incorporate such cyber security issues.

Human Resource Development

As ICT rapidly penetrates wide areas of social and economic activities, ways and means will be explored to make sure that every citizen has at least the basic skills needed to fully participate in the information society. ICT will be exploited so that people will be able to use in their daily lives, at the same time we will increase the number of skilled personnel in advanced areas of ICT. High priority will be given to human resource development in the field of ICT and to the enhancement of ICT literacy in the population as a whole.

Human resource development is essential for sustainable social and economic prosperity, and activities that use ICT itself, such as distance learning, can be of great help in human resource development. Various programs in this field will be conducted in co-operation with educational organizations, taking account of the economic, social and cultural diversity of the whole region and the world. Bhutan will also encourage development of appropriate technology to help combat illiteracy, as well as to help those with special needs, such as the hearing and sight impaired.

Cooperation and Research

Cooperation in exchanging personnel in research of ICT will be explored with other countries. Joint research will be highly promoted. At the same time, regional exchanges of information will take place regarding the enhancement of ICT literacy. Bhutan will also promote measures to help people of every age, background and location and level of physical ability to acquire these skills. It is important for Bhutan to cooperation with all countries in seeking solutions to ICT issues in order to establish an information society that respects economic, social and cultural diversity. Financial and professional resources will be enhanced or explored for this purpose.

Cooperation with organizations

Since the ICT revolution has global effects, it is important to include not only regional but also global co-operation in Bhutan's ICT perspective. Because action has started around the world aimed at bridging the digital divide, it is necessary to effectively co-ordinate all national activities with other global activities. For this reason, Bhutan will strengthen its co-operative relationships with other international organizations such as the International Telecommunications Union (ITU), which is the focal point for global telecommunication policy co-ordination; the Economic and Social Commission for Asia and the Pacific (ESCAP) and the Asia-Pacific Telecomunity and many others, which works for economic and social development in the region. Relationships with countries and organizations outside the country, private sector entities and relevant NGOs will also be strengthened.

ICT will be developed where necessary and enhanced where available to lead Bhutan and its citizens to the ultimate fulfillment of the national objective of Gross National Happiness.

Background

With significant developments in telecommunications infrastructures, information and communication technologies and the continued shift to more ICT oriented education system it was only imminent that Bhutan recognized the immediate need for an ICT Master Plan. The draft ICT Master Plan (Draft ICTMP) was prepared in 2000 under UNDP assistance.

Information and Communication Technologies has provided Bhutan excellent tools so that people can explore and exploit opportunities. ICT has enhanced business and governance in Bhutan. The once isolated regions of the country are now just a dial or click away from one another. Terrain, weather and distance no more stand as obstacles to development. Bhutan has a desire to be a world-class user and provider of ICT. There are many suitable and supporting parameters to fulfill this desire. The high literacy rate, a good digital telecom network, adequate policy support and a strong English language base make Bhutan an ideal country for ICT promotion. Bhutan will overcome the difficult communication problem. Efficiency in government and the ultimate delivery of development services to the people will be enhanced. People, particularly the unemployed, can take up businesses by using ICT facilities such as telephone, computer and Internet. Citizens will become smarter as they use Internet to engage in e-discussions and deliberations. Schools will use ICT services and the students will gain ICT knowledge at an early age to prepare them for the competitive and challenging career ahead. Medical services will reach the people at the right time. Government expenditures will be reduced hugely as the concept of e-government comes into the fore. More people will want to visit Bhutan as they learn and appreciate Bhutan more through the net.

The newly established Division of Information Technology, DIT under the Ministry of Communications developed the draft ICTMP under these considerations. The plan is guided by the plans and policies of the Royal Government in this sector.

It is recognized that coordination is an important component in carrying out cross-Sectoral ICT related activities. This will minimize duplication and will also ensure that all ICT activities are within the policy framework. Standard hardware and softwares will also be maintained to reduce expenditure in maintenance.

An ICT HRD requirement of the country will be assessed. Training needs analysis will be carried out and appropriate recommendations made to the government for funding and support. ICT training certification by all agencies in the country shall do so in close coordination with relevant agency. Job classifications for ICT professionals shall be revised and updated. In any society, the promotion of ICT awareness and knowledge to the general public is required.

In Bhutan, these shall be achieved through workshops and seminars to the public. Appropriate subsidies shall be sought from the government to promote ICT in the country. A government web portal shall be developed that shall work as the main web presence for information dissemination to the public.

The need for a Multimedia Law is immediate. A Multimedia Act shall be initiated that will lay the legal foundation for ICT related activities in the country. This draft ICTMP is based on various strategy papers prepared in the past. Some of the important ingredients that contributed to the preparation of the plan are:

Telecommunication development plan
Bhutan has a digital telecommunication network today. Besides reaching all district headquarters, telecom services are also available in some remote locations. For example, telephones were installed in Lingshi and Sakten. These places are located at a walking distance of more than 5 days from the nearest roadside.
There are plans to upgrade the backbone network to meet the growing demands for bandwidth and speed.

Internet Service Provider – Druknet
Druknet grew from an initial subscription of around 200 customers to over 900 customers in a span of 2 years. Compared to the population size that can afford an Internet service, this growth is very significant. The Druknet bandwidth to Concert, UK (subsidiary of British Telecom on Internet) has grown from a 256kbps link to 1Mbps link at present. Another 1Mbps link for Internet services with KDD, Japan has been opened.

Computers and Networks in the country
There are over 4,000 computers in Bhutan. Having 79% of these computers as Pentiums, it indicates that most of them were bought within the last couple of years. More than 50% of the organizations have established local area networks. Even the most isolated districts have at least 10 computers with them now. Internet connections in organizations are prominent.

ICT related organizations
The DIT was established on recommendation of the Good Governance study in 1999. The National Geographic Information System Coordination, NAGISC coordinates works related to geographic information system. The Bhutan Telecom Authority, BTA is mandated to regulate telecommunications and the Bhutan Network Information Centre, BTNIC regulates Internet services.

Many of the organizations have established ICT units since 1999. There are around 225 ICT professionals of which the government employs approximately 60% of them. The need of organizations is network professionals. As only 16% of the 225 people are network administrators or know something on network management, the requirement in this field of ICT is grave. Vocational training

institutes will have to be strengthened to meet these requirements. There are 16 ICT business enterprises in the country. Six of them are in ICT training business and more participation need to be encouraged.

Many of the organizations that have computers use them for word processing works. This indicates the need for diversification and promotion through trainings. Sharing of knowledge and resources will also have to be promoted so that ICT resources can be used optimally.

As there is already a good telecommunication network, in terms of infrastructure development, work will be needed in upgrading organization networks and establishing new ones. As affordability is still an issue, close coordination is necessary in using available bandwidths in the most cost effective manner.

Programs

1. The telecommunication network was designed for voice traffic. To establish an efficient telecom network for future ICT development, a National Data Network will have to be established. Additional Points of Presence are also required as more people use computers and Internet in the countryside.
2. All government offices should have individual LANs. Only after this, will organizations be able to use Internet in a cost effective and beneficial manner. These organizations will also have access to Internet and e-mails services.
3. The present ISP, Druknet will have to be upgraded. Much has already been done to upgrade. International bandwidth has been increased and new traffic route has been opened through KDD, Japan. However, local dial-up access is still slow due to the poor quality of telephone lines.
4. A government-wide Intranet has to be established. As this target is not feasible immediately, organizational Intranets will have to be put in place first. There are already efforts by various organizations like Education, Health, Planning and Agriculture in this direction.
5. Some pilot geogs will be provided with Computers and Internet access to assess the impact of ICT in geogs and villages.
6. A separate Ministry of Communications and Information Technology will be created by July 2002. This Ministry will be responsible for ICT and telecommunications sectors. Close coordination between DIT, BTA, BTNIC and NAGISC will be encouraged.
7. The Division of Information Technology will be strengthened with adequate resources.
8. All government ministries and agencies will have ICT units that will coordinate all ICT related works. Individual agencies and ministries should be able to plan and implement ICT activities by themselves.
9. BTNIC, whose functions are presently managed by Druknet, will be established as a Section under the BTA.

10. Strong ICT curriculum will be enforced in all government and private institutions.
11. ICT curriculum in schools will be highly encouraged. All schools and institutions will be provided with computers and where possible with Internet access.
12. A Bhutan ICT Forum shall be created where ICT professionals can share and learn from each other.
13. Where possible all national information systems ranging from geographical information, business information, personal information to agriculture information will be computerized.
14. Each Ministry and agency shall have their own ICT Master Plans.
15. An ICT Law will be prepared. The Ministry of Communication shall spearhead this initiative.
16. Dzongkhag fonts will be developed to encourage every citizen to use computer and Internet.
17. Mass ICT education and promotion shall be carried out through all available mediums.
18. Private ICT businesses will be encouraged through appropriate subsidies or support from the government or donors.
19. e-Commerce will be promoted through various public and private sector partnerships. Banking system will be appropriately encouraged to introduce on-line banking facilities. Bhutan Chamber of Commerce and Industries shall be strengthened to meet these challenges.
20. ICT human capacity will be developed so Bhutan can export softwares in future.

Footnote

The ICT Master Plan is only in draft form and is not an approved document yet. Necessary revisions and finalization of the document is pending. Though most of the planned programs and activities will remain unchanged, it is anticipated that such components as timeframe of implementation and costing will change with the final version.

CHAPTER 5 GROSS NATIONAL HAPPINESS, GNH

"Happiness is a shared desire of every human being. It is possibly the ultimate thing we want while other things are wanted only as a means to its increase.... Most socio-economic indicators are an attempt at measuring means; they do not measure ends.... I wish to propose happiness as a policy concern and a policy objective. In turn, this may call for a new policy orientation. This also implies new departures in research, if the concept is considered important. We need to ask how the dramatic changes propelling us into the 21st century will affect prospects for happiness. How will information technology affect people's happiness? How will shrinkage of biological and cultural diversities affect the individual and collective potential for happiness? Will the particular scientific worldview of contemporary education and curricula undercut in the next century the basis for the culturally rich and value-full basis of daily life? Will the process of secularization and nuclearization of family increase man's loneliness, and self-enclosure in the midst of urban crowd? Does the rapid automation of society and the economy increase or decrease the prospects for the happiness of the individuals? How will global capitalism and competitive international trade make people more vulnerable to unhappiness and uncertainly in their lives?"

Lyonpo Thinley Jamtsho
Minister of Home Affairs's address
Millennium Meeting in Korea, 1998

Gross National Happiness suggests that happiness is the objective of development. It is recognized that approaches to development throughout countries have lost track of the basic reason to development. The process is concentrated on the means rather than the ends. For example, it is seen that the increase in GDP has not directly influenced human happiness. The materialistic ambitions of mankind have given rise to more unhappiness and cruelty in societies. The parameters of development are not confined to monetary achievements. Bhutanese society believes the impact of development should be visible in the material, spiritual, cultural, environment and mental fulfillments. GNH reminds that the means must always be considered in terms of the ends. Every step in material development and change must be measured and evaluated to ensure that it will lead to happiness of the individuals. Buddhism states that progress of mankind should lead to happiness and human development.

Every policy and project in Bhutan are planned and evaluated not only based on the intention to increase GDP but also taking note to increase the well-being of individuals and society in all terms. Projects that do not address such issues are redesigned and reframed.

The environment policy is framed on the understanding that human beings and nature live symbiotically and they are indistinguishable from each other. GNH emphasizes the importance of sustainable development. This means difficult choices between different ways of increasing income or developing sources of citizen's power. GNH is Bhutan's bridge between values and economic development.

Strategy

The strategy towards GNH recognizes that computerization of government at all administrative levels both vertically and horizontally. This makes possible the development and maintenance of a comprehensive national database for use in policy planning, project development and social science research. Networking of administrations throughout the country will make possible the communication of knowledge applicable to different government offices. Computers will make it possible for the Royal Government to deepen its services to the people by devolving and decentralizing various levels of administration. This will give an increasingly computer-literate population greater access to government organizations and information. Computer and Internet in Bhutan have great potential for bringing together the various geographical regions and social groups in the country. The future is totally dependant on developing and creating a ICT-literate population and society.

The distribution pattern of computers in schools and institutions in Bhutan suggest a serious problem as far as ICT development is concerned. There is a wide gap between the same categories of institutions in the country.

It is stated that ICT is a key tool to Bhutan's successful development. Computer courses will be introduced in Sherubtse College and high schools. Government will invest substantially to computerize all high schools and institutions. It will however, require considerable investment both in computer hardware and in human resource development throughout the school system. Therefore education of people and children alike will need to be emphasized.

Internet

In the communities, access to computers and Internet will bring unimaginable benefits to the rural population. People can use ICT to search for information and tools by which people can gain knowledge. This will bring about fulfillment of desires and expectations leading to a more satisfying livelihood.

GNH stresses that access to Internet and the vast resources available depends on the fundamental and basic computer literacy of the society. Computer literacy may be achieved but for everybody from every corner of the country to access the Internet, a modern and robust telecommunications network and other resources are necessary. These will ask for huge investments. Bhutan strives to achieve the goal of a computer-literate population by year 2020.

Internet represents one of the greatest opportunities to the Bhutanese society. It can open up an entire universe of knowledge for the people and change their perception of the world. To take care of wider digital divide that might be created due to the promotion of ICT activities, Bhutan will provide ICT education to adults, youths and children so that every level of the society will benefit from the benefits of information and communication technology. The use of electronic

databases will be increased to make the work efficient and planning process smooth.

The growth of ICT in the past few years has contributed immensely to the socio-economic development of the country. These developments could transform Bhutan into a modern knowledge and skills-based society. It could also pose great constraints to the resources and create resource demands that will be difficult to fulfill in short durations. However, ICT will provide a foundation for development of the society. A close symbiosis between the cultural and environmental strengths and the developments in the field of ICT can lead Bhutan to achieve its goal of Gross National Happiness.

It is recognized that a person's happiness is dependant on many factors peculiarly to his/her level of income. A villager may be happier to have a piece of land than a computer. An officer may be happier to have a good profession than anything else. A housewife may be happier to have her children fed properly than owning a computer. Information and Communications Technology can play the central role in fulfilling this diversity of needs.

Bhutan Telecom Authority

The Bhutan Telecom Authority is the telecom regulatory department of the government under the Ministry of Communication. BTA is also responsible for regulating frequency allocations, cable TV and domain name allocations in the country due to the absence of a Broadcasting Authority.

Since its establishment, BTA has been actively involved in many programmes related to telecom and frequency regulation. The threat of frequency over usage is not serious. However, with the increasing number of telecom network and the possible privatization of value-added telecom services, many companies would come up with their own networks and services. Use of fixed mobile phones that use frequencies in the VHF and UHF ranges are common in urban town. There are already some reports of radio cross talks and billing complications. Bhutan Telecom Authority is poised to regulate this random use of radio frequencies. The concentration of Bhutan Telecom networks in the Indian border areas will ask for coordination of frequencies with Indian operators. Telecom regulations have to subscribe to international standards and directives.

BTA also coordinates various other telecom and electronic communications regulatory issues. International transit issues are important components of regulatory issues. As regulator, BTA also collaborates with Bhutan Telecom in international transit negotiations and settlements.

One of the major activities of BTA is the regulation of cable television operators around the country. Many cable operators are exploring possibilities of data transmission over cable lines and ultimately moving towards becoming alternate ISPs. With customer demands for value-added services and entertainment increasing by the day, services like Web-TV and VOD are possible technologies that could enter Bhutanese homes. Taking note of these possibilities, regulations will have to be streamlined.

Many of these issues are taken care of through the ongoing World Bank project on "Strengthening of Policy, Regulatory and Institutional Environment in the ICT Sector".

With ambitious plans for nation-wide and sector-wide ICT services planned in the country, BTA will have to be strengthened in all areas to cope with the growth. Human resource capability will have to be enhanced. New monitoring and supervisory equipment and facilities have to be installed. Similar support and capacity building will be required for the establishment of the Broadcasting Regulatory Authority in the future.

Division of Information Technology

The Division of Information Technology is a Division under the Ministry of Communication. This Division was created along with the creation of the BTA to look after IT related activities in the country. However, DIT management says that they still do have a clear mandate. Given the strong relation between IT related activities and telecom sector in the country and as well the poor status of IT development, it is envisaged that DIT will not have much to look after for the time being. Despite resource constraints, the organization is pursuing this activity. It is also engaged in the on-going development of a homepage for the Royal Government. Others activities include on-the-job training for computer engineers, ICT surveys and information dissemination.

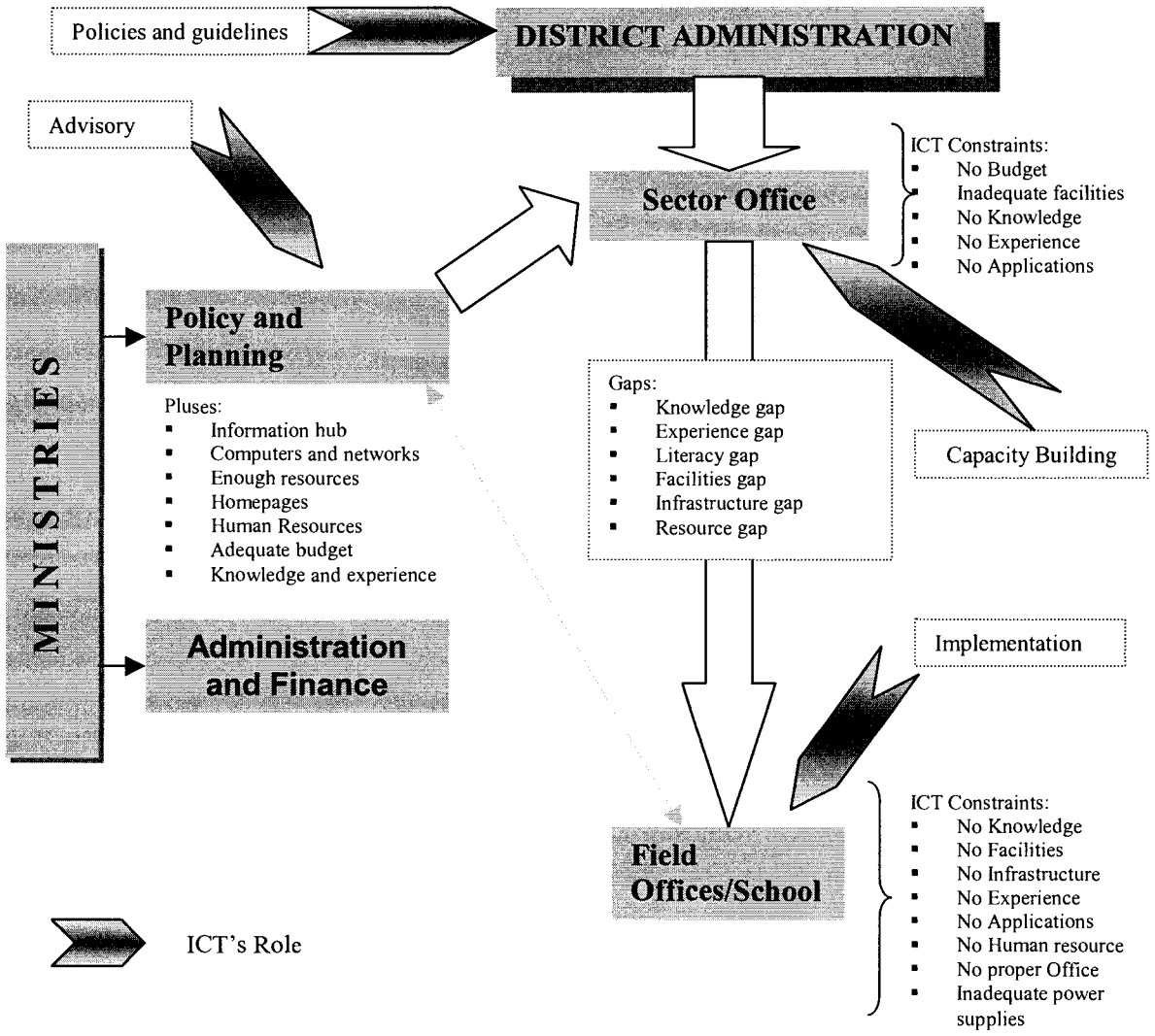

Figure 1 - Schematic illustration of Sectoral working method

Bhutan is a small country with a small population and a small government. Many of the Ministries already have some form of ICT master plan or the other. Where there are no such plans, ICT activities already form part and parcel of annual plans. ICT development will have to come to all sectors if the Bhutanese people

are to benefit in the long run. However, there are confusion, misunderstanding of the concepts and lack of coordination in this approach.

A number of these ICT activities can be fulfilled in a cost effective manner if organizations coordinate and cooperate. It is a reality that individual networks and services in most of the organizations will be under-utilized. This is because the district and field offices are far behind in the use of computers and Internet technologies.

DIT should work as a facilitator in this respect. It has to function in various capacities to the different levels of organizations and government agencies. DIT should play an advisory role to the Policy and Planning Divisions of various Ministries. Standards and features of latest ICT facilities have to be informed for the policy makers. At the district level, DIT has to orient administrators on ICT policy issues. They have to be guided on the benefits that ICT can bring about. At the sector level, DIT has to assist sector offices with capacity building. Computers have to be supplied if necessary. Users have to be trained. Applications have to be recommended or supplied. Infrastructures have to be built. And finally at the field, primary schools or basic health units, DIT has to assist in the implementation of ICT projects. Due to resource constraints, it might be difficult initially but as people are trained in a few locations, they have to be pooled together to implement the projects.

This top-down approach to ICT implementation in the government has created a wider ICT knowledge and experience gap between the different levels of governance. While headquarter offices surf the net and use the latest office gadgets, field workers have not even used computer. The resources that can be availed from the net are in electronic formats and can best be transmitted or translated in the same form. The lower level schools, basic health units, field and extension centres do not have the facility to interpret or access such information. This is appropriate in developed societies where the grassroots populations and workers are ICT literate. In Bhutan the situation is different. Besides illiteracy, infrastructure is poor and facilities not available at lower levels of society. Unless organizations plan ICT implementation on a bottom-up approach, not much will succeed in this area.

There is no National Multimedia Act (or ICT Act) in the country to guide activities accordingly. This is one area that the policy and Planning Division, Ministry of Communication should spearhead. General rather than specific standardization of ICT equipment and infrastructures have to be worked upon. Human resources have to be enhanced. Backbone infrastructures will need study and upgrades sooner rather than later. As backbone telecom network is virtually sufficient for telecommunications services, relevant ICT agencies will have to explore possibilities of enhancing the bandwidth capacity of the networks.

Bhutan Telecom

Bhutan Telecom, formerly known as Division of Telecommunication under Ministry of Communication (MOC), was corporatized from July 2000. The Government of Bhutan is the sole owner of Bhutan Telecom. It owns, manages and operates the domestic telephone network and all international services as well. As a government organization, the Division of Telecom's priority was the provision of efficient telecom services to all sectors of the Bhutanese population including rural areas. However, after July 2000, Bhutan Telecom by virtue of it being a corporation has restructured its priorities. Revenue generation is an area of corporate effort. Despite this objective Bhutan Telecom has been pursuing rural telephony as an important component of its activities that would contribute to the overall socio-economic development of the country. This activity forms as important component of Bhutan Telecom's direction. As such, today many parts of country have telephone services.

Structure

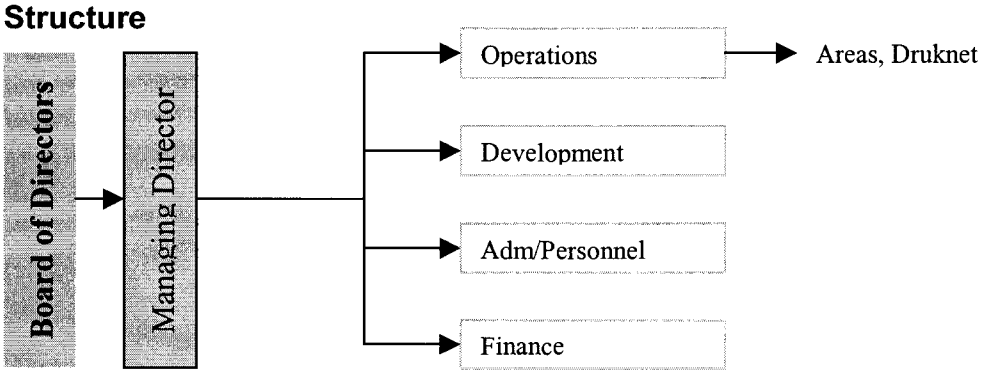

Figure 2 - Organization Structure

Telecom Network

The domestic telephone backbone network uses 8Ghz digital microwave radio system carrying a 34Mbps bandwidth digital stream. A number of spur routes at 8Mbps and 2 Mbps are dropped from repeaters and exchanges to reach towns and urban centres along the route. The national telecom network was established under the financial and technical assistance of the Government of Japan at an approximate cost of US$ 60 million. Telecom till early 1990s was otherwise comprised of 3 isolated physical links in the three regions, east, central and west that were able to carry a couple of telephone trunk lines and no data.

The achievement made in the telecom sector is very much applauded by all sections of the Bhutanese society today. Bhutan Telecom manages and operates more than 90 base, repeater and terminal stations throughout the country. Some of the repeater stations are in the most inhospitable locations. For example, Thrumsingla repeater station is located at an altitude of 4,200 meters above sea

level and 7 kilometers away from the nearest roadside. It is under heavy snow and ice for almost 5 months. As there are electronic equipment in these repeater stations, powering them 24 hours a day all round the year is a nightmare for the organization. Diesel generators are located but fuel gets frozen in the cold months. Solar panels are installed but are of not much use in summer due to perennial rain and cloud. AC Batteries run out of power very often. Despite these difficulties, there have hardly been major breakdowns in the network. The response to network failures is swift and timely.

The growth of telecom subscriber is significant in the 1990s. This can be attributed to the completion of the domestic telecom network. Figure 3 shows the exchange capacities and the growth of customers. As can be seen after the establishment of Druknet, the gap between capacity and subscription is narrowing.

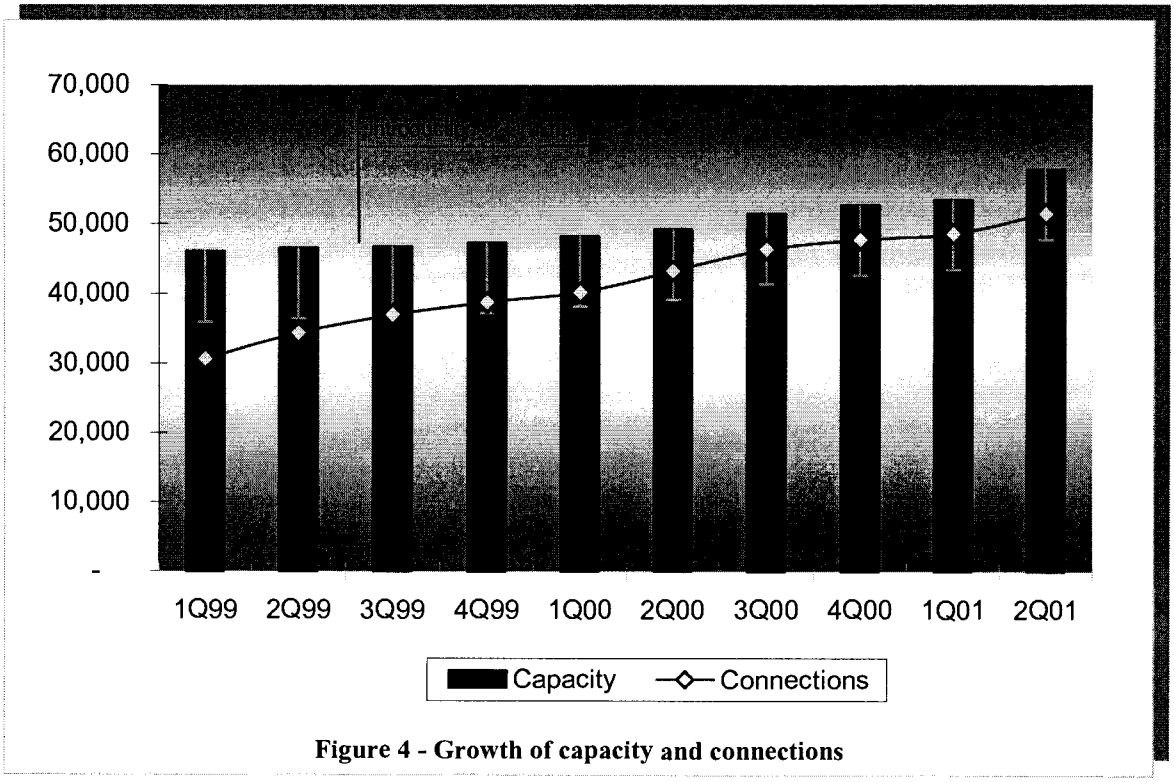

Figure 4 - Growth of capacity and connections

Besides Microwave radios, the network also consists of Digital Radio Multiple Access Subscriber System (DRMASS) to small towns and some district headquarters. A number of Basic Health Units and schools in rural locations have access to telephone through VHF and UHF analog radio links. Some telephone exchanges have used PasoLink, a new type of transmission system for small populations.

Demand Assigned Multiple Access, DAMA technology that uses Intelsat satellite system is used to access very remote places only. As rural communication is the

priority of the Royal Government, Bhutan Telecom is now making a number of pilot tests to select the best technology for rural communications. This selective choice and testing is necessary to economically realize the rural communications project. One of the technologies under study is Voice Over Internet Protocol, VOIP. This technology is ideal for voice as well as data transmission for remote locations and thin population.

The international telecom traffic is routed through its Intelsat Satellite Station based in Thimphu. Bhutan Telecom has a dedicated International voice traffic circuit of 512 kbps with British Telecom (14 circuits using LRE), 512 kbps with Singapore Telecom (7 circuits and 1 leased data) and 512 kbps with KDD, Japan (6 circuits with 2 idle).

The Master Plan for the National Data Network (NDN) was prepared in 1998. Due to unavailability of funds, the project could not be implemented. Currently many Ministries and agencies in the country have ICT plans. As the number of projects and activities increase in the districts, the need for more reliable and faster networks will be necessary. Telemedicine being one of the possible projects in future. Bhutan Telecom plans to increase the bandwidth of its network in phased manner. The implementation of the expansion project will however, be driven by demands for such services. The preparation for data circuits in possible locations has already been completed.

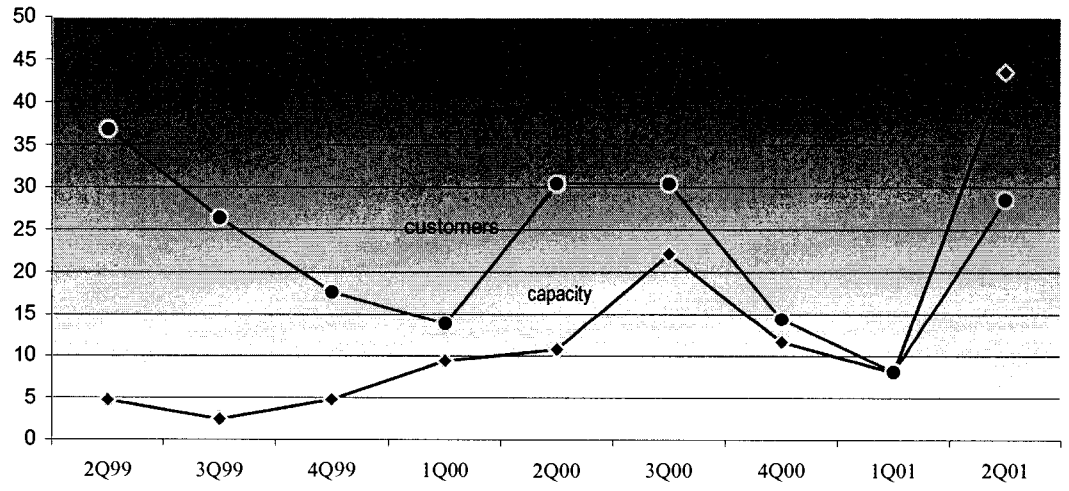

Figure 5 - Quarterly percentage growth

There is an interesting pattern of the growth rate in the exchange capacities available and the growth of the number of customers. There is obviously a strong correlation between these two.

Figure 4 indicates the rate of growth and not the actual growth figures. It can be

seen that though capacity was increased after the establishment of Druknet there was actually a decreasing growth till the last quarter of 1999. There was sudden increase in this rate in 2000. This was due to a major reduction in telecom as well as Druknet tariff in the first quarter of 2000. This pattern is again repeated in the first quarter of 2001, yet again due to reduction in tariff.

Rural Telecommunications

One of the functions of Bhutan Telecom is to perform services for the Government [Bhutan Telecommunications Act, 1999 Sec. 3.1(c)]. During recent years and particularly after the establishment of the Domestic Telecom Network, emphasis of the government is geared towards exploiting ICT facilities including telecommunications and Internet to enhance various development activities. Ministries and agencies have come up with their own ICT plans and activities to improve working procedures and productivity. Agencies have also introduced a number of in-house and external trainings in the use of computers. Villages and communities in Bhutan are located at very remote and far-off places. The aura of development activities therefore, cannot be segregated from planning activities with a rural focus.

It is this 'rurality' and community-based activities of the various social sectors that have created a self-made demand for efficient telecom services in rural areas. Decentralization is one of the main strategies of the Royal Government. Since its promotion since a decade ago, decentralization has resulted in numerous community based decision processes. The GYTs and DYTs are important institutions that facilitate people-centered decision process and implementation in Bhutan. This is yet another area that would sooner or later demand ICT services, not the least telecom services.

Bhutan Telecom has prioritized rural telecommunications as an important activity in the future. The 9th Plan period will guide and emphasize and to some extend compels Bhutan Telecom to pursue its rural telecommunications activities in a more aggressive manner.

Rural Telecommunications Master Plan

There was Rural Telecommunications Master Plan developed in 1999. The plan was prepared taking note of the popularity and success of the DRMASS technology in Bhutan. Despite the high cost, there are numerous features in this system that would ultimately benefit the rural people. Due to fund constraint, the implementation of this Master Plan could not be mobilized due to fund constraints. Moreover, this technology has become redundant and Bhutan Telecom has serious question about the use of this technology for its rural telecom projects. Bhutan Telecom is carrying out some pilot projects on an IP based rural telephony system. The result of this pilot project [Bhutan Telecom, VOIP Project] will decide the implementation strategy of the Rural Master Plan in the future. The community based dual strategy of telecommunications and Internet rural provisions will greatly benefit from this technology.

Druknet

Druknet is the only Internet Service Provider (ISP) in Bhutan. Druknet was established on June 2nd, 1999 marking the Silver Jubilee Celebration of the coronation of the present King. It was established under the financial and technical assistance of IDRC and the UNDP (APDIP). Bhutan is one of the last countries in the world that did not have Internet until 1999 and this development is hailed as a landmark and historic event in the country.

Druknet is a technically independent Section under the Operations Division of Bhutan Telecom and is located in Thimphu. With close coordination with other relevant sections and units, it operates and manages Internet services in Bhutan. Under the directive of BTA, the Bhutan Network Information Centre, BTNIC, which is physically located in Druknet, coordinates domain name addresses. The first level domain 'bt' is governed and owned by the Royal Government, five second level domains, 'gov', 'com', 'org', 'net' and 'edu' are managed by BTNIC and the lower level domains belong to the individual enterprises or organizations.

Internet traffic from Bhutan is routed through Concert, a British Telecom subsidiary for Internet services in the UK. With growing customer base and traffic, Internet data bandwidth has continually been upgraded. When Druknet started there was only 256 kbps of bandwidth. Recently with the addition of 1 Mbps of extra bandwidth with KDD, Japan the total data bandwidth reached 2 Mbps. Except on upgrades and serious technical problems, almost all maintenance of Druknet facilities are done by national professionals. Human resource development has been adequate in this sector but as new services and expansions are introduced, the number of engineers and technicians will have to be increased.

Druknet equipment was dimensioned for 500 dialup connections and 3 leased line. However, with expected growth in customer base, Druknet had to experience unplanned upgrades and capacity enhancement. Druknet anticipate 500 Internet users after 2 years of its establishment but with more than 800 subscribers it is already 75% above target. The bottleneck for end user imminently has been the dialup procedure; the modem bank could not handle all incoming requests. A new modem bank installed in August 2000 was also getting overloaded. Despite the two POPs in Trashigang and Phuentsholing, the Internet traffic demand is increasing by the day.

Services

There were isolated uses of Internet in the pre-1999 years as well. Some organizations did subscribe to Internet from Internet Service Providers from nearby countries and some as far as in the United States. But the costs of such connections were incredibly high. Table 1 shows the basic minimum cost of Internet service for a 15 hours package through the VSNL, Calcutta, India Limited from Bhutan before 1999. Telephone line charges constituted the major component of the expenditure.

Internet charge for 15 hours before 1999		
Details	***Rate***	***Total***
Internet One-time subscription charge	*Nu. 7,000*	*Nu. 7,000*
Internet Usage charge	*15 hours free*	
Telephone charge	*Nu. 24 per minute (@24x15x60)*	*Nu. 21,600*
Grand Total		***Nu. 28,600***

Table 1 - Appr. 15 hours Internet charge before 1999

Druknet was established with an intention to provide Internet services to all categories of people from all economic levels. As such Druknet tariff was fixed homogenously all round the country. No matter from where you dial the Druknet Server from, one would be paying the same connection charge for telephone as well as for Internet services. Unlike in many other countries where the telephone charges will be on actual basis, this was a big sacrifice from Bhutan Telecom.

Growth of Druknet

Customers

Internet subscription has also grown consistently during the 2 years of Druknet's establishment. Figure 5 shows the half yearly cumulative growth pattern of Druknet customers over this period. Many of the subscriptions were for Internet Lite service where customers used predominantly e-mails and occasional Internet service as and when required. Though digital telecommunications services have reached every district, computers are still not very popular in most of them.

The regional distribution Druknet customers are Thimphu 71%, Trongsa 3%, Trashigang 5%, S/Jongkhar 1%, Gelephu 1%, Phuentsholing 14% and Paro 5%.

Private individuals and enterprises constitute 51% of the customers and government institutions 30% of the customers of Druknet. With the encouraging growth of the private sector companies, this ratio is expected to continue or even

improve in the future. ICT education and introduction of computer curriculum in schools are also encouraging signs of a healthy enterprise and private sector that will use computers and Internet more. International organizations and expatriates constitute about 15% of the customer base.

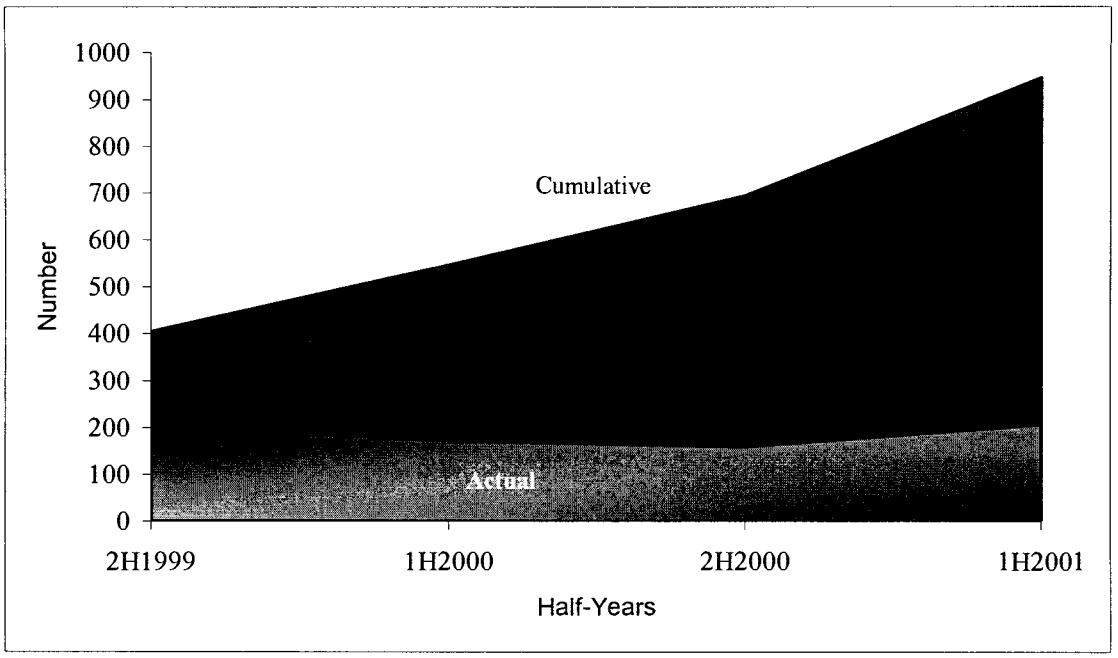

Figure 6 – Cumulative half-yearly growth of Druknet customers

The cumulative growth of Druknet users is encouraging. There has been significant increase in the number of customers since the second half of 2000. It is expected that there will be further increase in the rate of growth. This assumption is supplemented by the increase in the Internet bandwidth that would increase speed and efficiency that were the primary bottlenecks to customer satisfaction besides cost. The month-wise growth is shown in figure 6.

The following describes the area wise Druknet analysis.

Thimphu area

The concentration of customers in Thimphu region is mainly due to the popularity of computers in the capital. Most of the offices are also located here. Even the small percentage of home computers used by Bhutanese is from Thimphu. International organization offices that are very important Internet customers are located in Thimphu. All the government Ministries are located here and there is increasing use of computers in offices.

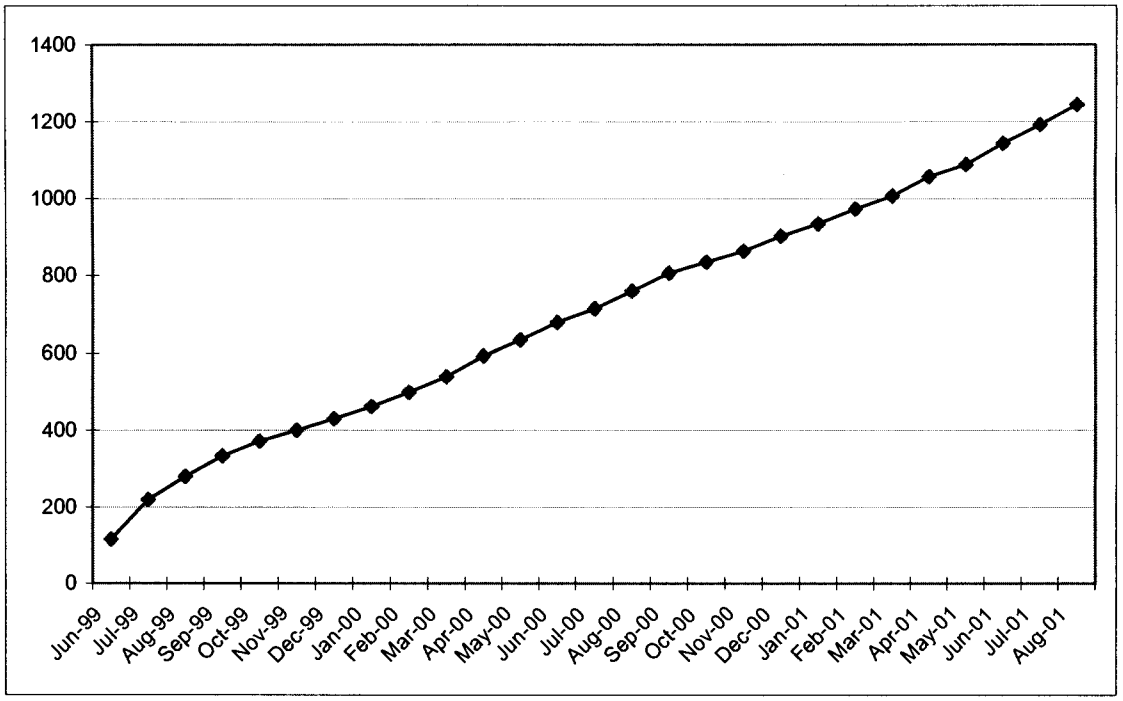

Figure 7 - Month-wise growth of users

Trongsa area

Trongsa is located in the central region and contributes very little to the customer base of Druknet. This region has a low concentration of urban population. In fact, Jakar including the telecentre contributes substantially to the customer base in this area. Even Trongsa town has a very insignificant number of Druknet customers. The main SNV (Netherlands Development Organization) field office is located in Zhemgang town. Due to the small number of projects and the dispersion of population in this region, customer base will continue to be low in this region.

Trashigang area

The number of government projects and activities are increasing in the eastern region. The Kurichu hydo project, the national lemon grass project, the eastern referral hospital, Sherubtse college and many other important establishments are located in Trashigang area. Many International organizations also have their field offices there. With the access to modern telecom facilities, the already popular ICT usage is anticipated to increase.

SamdrupJongkhar area

Internet users' base in this area is very minimal. Similar to Trongsa area, the dispersion of population, small number of projects and small number of urban towns contributes to this small number. The Royal Bhutan Polytechnic that would have been a major user has been shifted to Phuentsholing area. The number of Druknet customers in this region will remain small.

Gelephu area

Gelephu has a potential for growth of population as well economic activities. There is a high concentration of urban population. Availability of flat lands and vicinity to the Indian market will encourage industrial establishments. The growing number of public telephone booths and Internet Cafes will be new users of Druknet.

Phuentsholing area

Phuentsholing is a business hub of Bhutan and is located near the Indian border. Many private companies and major industrial establishments are located in Phuentsholing. Due to the access to digital telecommunications services, these companies and industries will increasingly use computer and the Internet in future. Phuentsholing also has a number of public telephone booths and Internet cafes. The two technical colleges are also located in this area.

Paro area

Paro will witness substantial growth in the number of computers and usage of Internet in the future. The headquarters of Civil Aviation division and DrukAir, the national airline is located in Paro. The National Institute of Education is located in Paro. As ICT curriculum is introduced in schools and institutions, NIE will become a major ICT hub in Bhutan.

Revenue

The establishment of Druknet was not driven by the expectation of immediate profits. Even with more than 800 paying customers today, Druknet is around the point of breakeven only. The financial assistance provided by IDRC and UNDP offset most of Druknet's capital expenses.

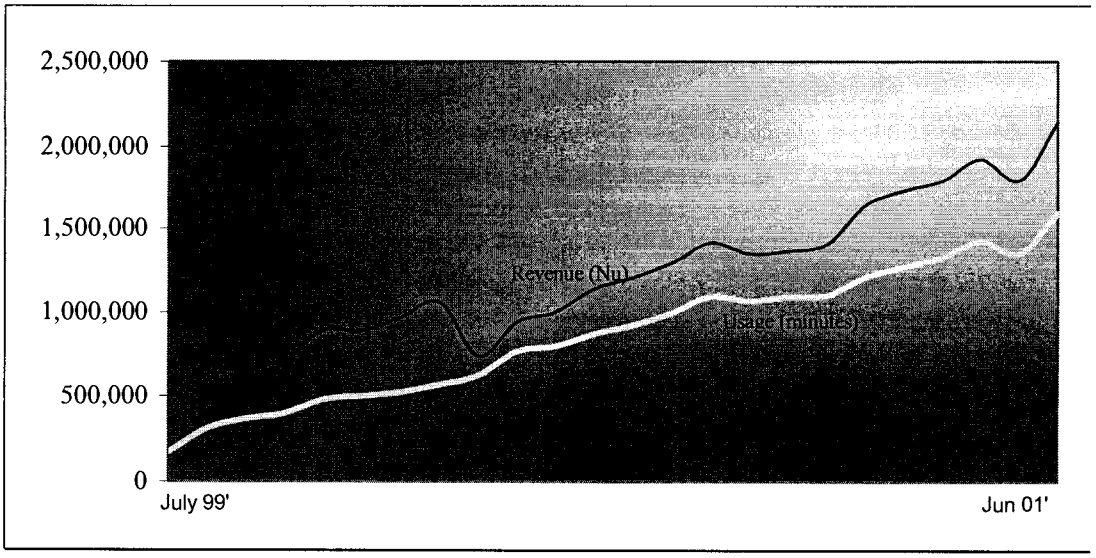

Figure 8 - Growth of Druknet revenue and usage

Considering 35% expenses on training, structures and logistics and a 10% depreciation rate, the return on assets of Druknet is approximately 34.27%. As Druknet does not have any payback obligations, this ROA is very encouraging. New investments like bandwidth and equipment upgrades, training, and new packages are made by its parent organization, Bhutan Telecom. The rate of growth of Druknet customers and revenue is stable.

There was a decrease in revenue by 31% in March 2000 when Druknet tariff was reduced. Still then, Druknet maintained a monthly average growth of 10% over these 2 years and is expected to grow at this rate.

Figure 7 shows the growth in revenue in relation to the growth in usage hours. Druknet has also suffered from a number of setbacks that have directly affected its revenue. Revenue has substantially gone down during times of technical breakdowns. For example the growth rate was –5% and –7% in October 2000 and May 2001 when there was service outages. Figure 2 shows the growth pattern of revenue and usage time. Druknet also suffered a major technical breakdown in early 2001. The correlation of 0.976 between revenue and usage time indicates a healthy relationship between usage and revenue despite technical breakdowns.

Services

The categories of Druknet services have also been diversified. The number of packages grew from 6 in June 1999 to 16 by June 2001.

▪ *E-mail*	▪ *Virtual E-mail Domain Address*
▪ *Internet Lite*	▪ *Web Hosting*
▪ *Internet Plus*	▪ *Web Advertising*
▪ *Internet Timed*	▪ *Technical Consultancy Services*
▪ *Pre-Paid Internet Plan A*	▪ *Internet Business Premium*
▪ *Pre-Paid Internet Plan B*	▪ *Internet Night-Surfer*
▪ *Internet Business*	▪ *64 Kbits/s Leased Line*
▪ *Dial-On Demand*	▪ *128 Kbits/s Leased Line*

Druknet hosts 26 websites today. The consultancy services section assists organizations and agencies to develop the web pages. The hosting charges are given in the package costs section. Druknet has also established dedicated 64 kbps leased lines with 7 organizations. These organizations general develop and manage their respective webs by themselves.

The following table will show the hosted websites and the dedicated leased circuits.

Government Sites	
Royal Audit Authority	http://www.raa.gov.bt
Department of Education	http://www.education.gov.bt
Druknet	http://www.druknet.net.bt
Division of Information Technology	http://www.dit.gov.bt
Construction Development Board	http://www.cdb.gov.bt
Youth Development Fund	http://www.youthdevfund.gov.bt
Department of Tourism	http://tourism.gov.bt
Bhutan Cultural Trust Fund	http://www.ctf.gov.bt
Bhutan Trust Fund	http://www.bhutantrustfund.org.bt
Bhutan Network Info.Cenre	http://www.nic.bt
National Agencies	
Bhutan Telecom	http://www.telecom.net.bt
Bhutan Post	http://www.bhutanpost.com.bt
DrukAir	http://www.drukair.com.bt
International Organizations	
Netherlands Development Agency	http://www.snv.org.bt
World Wildlife Fund	http://www.wwfbhutan.org.bt
Japan Intrn. Cooperation Agency	http://www.jica.org.bt
Private Companies	
Bhutan Travel Bureau	http://www.btb.com.bt
Wangchuk tours and treaks	http://wangchuktt.com.bt
Lhomen tours and treks	http://www.lhomen.com.bt
Chhundu tours and treks	http://www.chhundu.com.bt
Taktsang tours and treks	http://taktsang.com.bt
Sophun tours and treks	http://www.sophun.com.bt
Yarkay tours and treks	http://www.yarkay.com.bt
Ezekiel tours and treks	http://www.ezekiel.com.bt
Wangpoh Sales and Service	http://www.wangpoh.com.b
Bhutan Travel Service	http://www.bhutantravel.com.bt
Leased Lines	
UNDP	http://www.undp.org.bt
UNICEF	http://www.unicef.org.bt
Netherlands Development Agency	http://www.snv.org.bt
Royal Institute of Management	http://www.rim.edu.bt
Ministry of Agriculture	http://www.moa.gov.bt
Planning Commission	http://www.pcs.gov.bt http://www.bbs.com.bt
Bhutan Broadcasting Service	http://www.bbs.org.bt

Package Costs

The charges and price for various Druknet packages and services are given below. The Druknet charges are very high. This is evident from users' survey data as well. There are plans to reduce the charges in a phased manner.

Service Type			***Setup Fee***	***Subscription***	
Web Hosting (Max 10MB)			*2,000/-*	*8,000/- per year*	
Advertisement	*Top half*		*1,500/-*	*3,000/- per year*	
	Bottom half		*1,000/-*	*2,000/- per year*	
	Other pages		*500/-*	*1,500/- per year*	
Business directory			*FREE*		
Domain Name			*5,000/-*	*2,000/- per year*	
IP Address			*One-time 300/- per address*		
Consultancy			*500/- per man hour*		
Package	***# of E-mail boxes***	***Allocated hours***	***Registration fee***	***Monthly fee***	***Extra charge per minute***
E-mail	*1*	*5*	*300/-*	*400/-*	*1.5/-*
Internet Lite	*1*	*15*	*500/-*	*1,000/-*	*1.5/-*
Internet Plus	*1*	*30*	*1,000/-*	*1,800/-*	*1.5/-*
Internet Timed	*1*	*Actual*	*1,000/-*	*2/- per minute of actual time*	
Pre-paid Internet 'A'	*1*	*30*	*3,500/-*	*-NA-*	*-NA-*
Pre-paid Internet 'B'	*1*	*60*	*6,000/-*	*-NA-*	*-NA-*
Internet Business	*5*	*60*	*1,500/-*	*2,500/-*	*1.5/-*
Internet Business Premium	*8*	*100*	*2,500/-*	*4,000/-*	*1.5/-*
Dial-On-Demand	*10*	*100*	*5,000/-*	*5,000/-*	*1.5/-*
Internet Night-Surfer	*1*	*20*	*500/-*	*800/-*	*1/-*
Additional Mail boxes	*Max 10*	*-NA-*	*One time setup fee of 500/-*		
Virtual e-mail domain address	*As per package*	*-NA-*	*One time setup fee of 500/- per e-mail address*		
64 Kbits/s Leased	*-*	*Unlimited*	*40,000/-*	*40,000/-*	
128 Kbits/s Leased	*-*	*Unlimited*	*50,000/-*	*65,000/-*	

CHAPTER 8 COMMUNITY AND RURAL DEVELOPMENT

Bhutanese are primarily farmers and more than 70% of our people still live in villages. Approximately 72% of the land is covered with forests and the amount of land available for agricultural purposes is very limited. Most recent figures show that only 7.8% of the total land is actually used for agricultural production and farming. The valleys in the central region and the little flatlands in the southern part constitute most of this. Many of our Bhutanese households own livestock. The average size of a family is 6.5. The number of houses per village range from as little as 2 houses to 100 houses. Due to the terrain, houses in villages are spread far and wide with substantial walking distance from each other. Most of the rural Bhutanese women can weave. Rice, millet, barley, wheat, potato and buckwheat are some of the farm products. Apple, mandarin, peach, cardamom and ginger are prominent cash crops. While wild mushroom are common to find in the mountains, mushroom farming is yet another source of good income to rural community.

The normal life of villager farmer is full of domestic and farm activities. One would get up, prepare food for children, feed cows and milk them and head to the fields. Children would go to school and wives would start cooking lunch. While men would work in the farms to sow seeds or plough, women would weave after finishing household chores. Cattle left in the jungle would come back in the evening. Women will prepare supper and men will milk cow and prepare grains for food. As most villages do not have electricity many of the evening works are carried out under a dimly lit kerosene lamp or sometime in early evenings when there is still lot of light.

Due to the continued promotion of rural development activities by the various sectors, rural life and activities have changed. Today basic health units are at walking distances of houses. Agriculture extension workers continually help and advice villagers in enhancing production. Community schools are built at the vicinity of rural houses so that children do not have to walk hours as in the past. Telephones and electricity have reached many villages. Where possible roads have been constructed. Bhutanese villages and communities are much better than they were a decade ago.

Organizational structure of districts

The organization and working system in districts are designed to facilitate development works with efficiency and with the minimum bureaucracy. The Dzongdag (district administrator) is the administrative head of the district. He supervises and administers all development activities in the district. Dzongdags are direct nominees of the King. The figure below shows the structure of a district. Though this structure is predominantly true of most of the districts, some districts have slight different structures that are based on the size and activities.

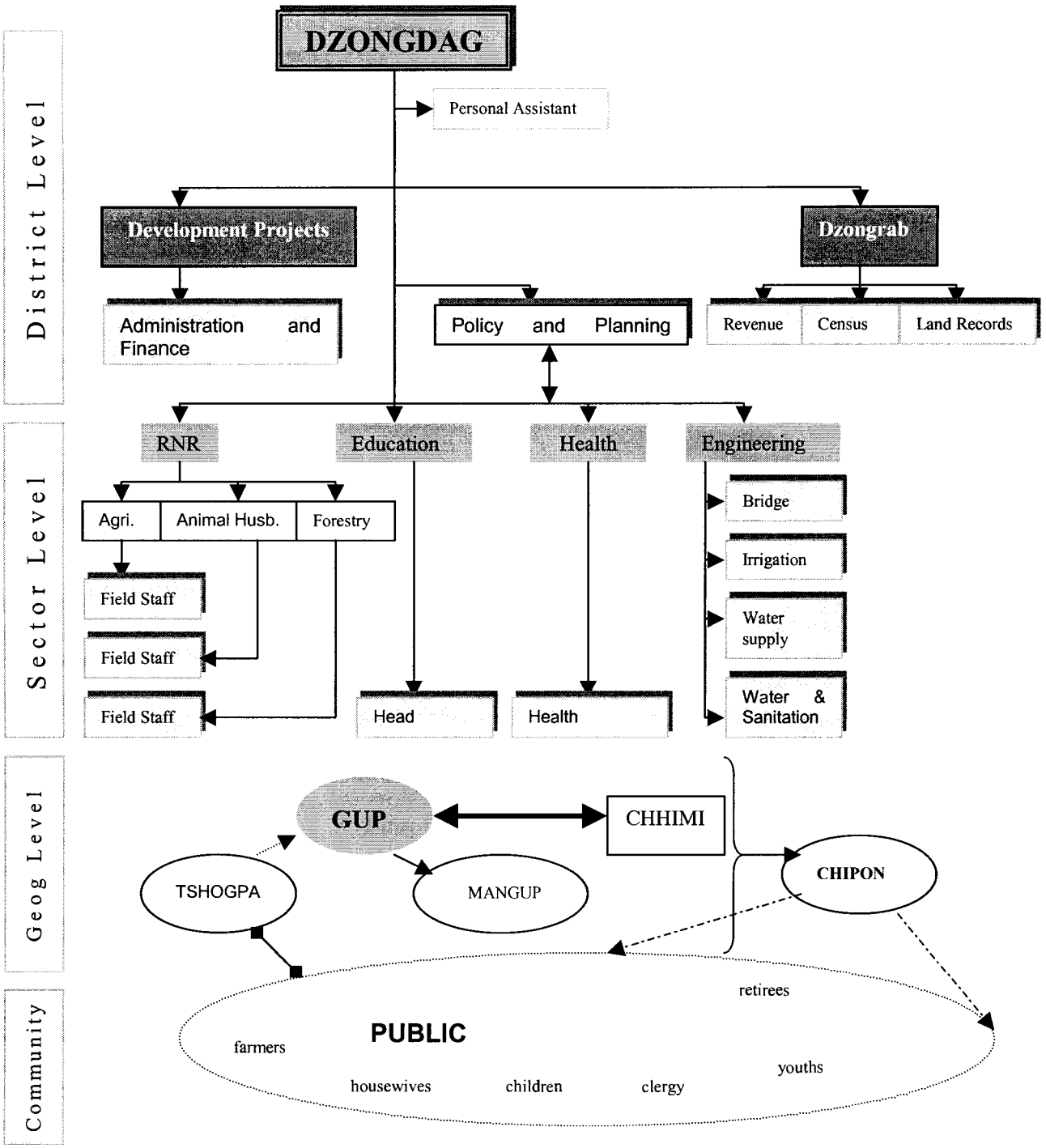

Figure 9 - Structure of District Administration

Coordination Direction Information Consultation

Women in Bhutan

Women are a strong economical force in Bhutan. The growth in their contribution to GDP through their domestic activities has been very consistent. Women in Bhutan are the role players in the villages and society. They are active from children's upbringing to agricultural works. Bhutanese women are strong both mentally and physically and they have proven these qualities down the centuries. 22% of our women are heads of families. Compared with 21% for men, 18.9% of our women are economically active in the villages. This amounts to inferring that men and women produce almost the same output in rural areas. It is also found that 58.2% of our rural population is unpaid family workers and this constitutes 34.9% domestic workers who constitute mostly of women.

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However, despite these qualities and statistics, women are generally viewed as a weaker sex. Women in Bhutan are entrepreneurs who have sustained families all along. However, their innovations and knowledge have remained unnoticed. Society normally view women as the recipients rather than generators of knowledge and economic benefits. There are a number of agencies that take women's activities directly into their programmes. The National Women's Association of Bhutan is one such active agency.

The National Women's Association of Bhutan

The National Women's Association of Bhutan, NWAB was established in 1981. It is a non-government organization that caters to women's issues in Bhutan. Its activities are focused on improving the socio-economic status of Bhutanese women. NWAB is involved in various activities that would improve the living standards and status of women in Bhutan and they create awareness among women of the importance of various social services and knowledge. Women are also encouraged to take part, by virtue of their contribution, in the overall socio-economic development activities of the country. A number of economy generating programmes such as weaving, smokeless stoves and family health, have been introduced in the rural areas where women play major agents for implementation. One of the very popular schemes targeted at rural women is the micro-credit scheme. NWAB trains around 40 weavers every year. After completion of their training the graduates are given small amounts of money to start their own small business.

With a seed fund of US$ 73,000 from the IFAD (International Fund for Agricultural Development), NWAB has disbursed credit or small loans to around 1,500 women as of today. Credit amount ranges from Nu 1,000 to Nu 5,000 that are payable within 1 year and 3 years respectively. Initially planned to be finished within 3 years, this project has expanded to 6 years now with additional funding of Nu 300,000 from the Austrian Cooperation Agency, ACB.

ICT and Community Development

Despite serious fund constraints and absence of adequate support, many government and non-government agencies including the NWAB aim to promote

community development in Bhutan. Information and Communications Technology will be used in their areas of work. Appropriate, efficient and affordable use of ICT can bring great benefits to the rural population. The successful implementation of the Multipurpose Community Telecentre, MCT in Jakar has given new direction and focus to the use of ICT for community development. The benefits that can be derived from such technology and strategies are huge.

There is a UNDP and local administration initiative to establish a telecentre in Trashigang town. Ultimately with enough donor participation, 20 telecentres will be established in the 6 eastern districts. Atsuko Okuda, Programme Officer of UNDP notes that the primary aims of these telecentres are to promote business, ICT education and community development. The people and administrations at the vicinity of the telecentre would benefit from such facility.

Appropriate web portals for community business can be developed and published in the telecentre server. A dynamic web would promote several services like on-line product auctioning like handicrafts. Previews and online displays of products, material selections and various other parameters of e-business will popularize Bhutanese products. Information on products can be collected from the villages on a regular basis and published. The variety of materials can be expanded to other indigenous products as well. Intra and inter District trades can also be promoted by suitable information and decimation system. People in nearby districts and even villages can trade poultry products, vegetables and animals. As logistical works and activities are already in place, the promises of ICT are certainly positive.

The Organization

The Ministry of Health and Education has two divisions: Health and Education each headed by a Director. As in all Ministries, there is a Secretariat that is responsible for the Policy and Planning Division and the Administration and Finance Divisions. The health and education divisions will be established as two separate Ministries in 2002. After the separation, the Education Ministry will have its own Policy and Planning and the Administration and Finance Divisions.

The Education Division has 6 sections, education monitoring and support division (EMSD), curriculum and professional support division (CAPSD), school planning and building division (SPBD), Bhutan board of examinations division (BBED), youth guidance and counseling (YGCD), adult and higher education division (AHED) and the new created Division of Employment and Labor (DEL). Figure 9 shows the structure of the Education Division. These will be established as individual divisions after the creation of the Education Ministry.

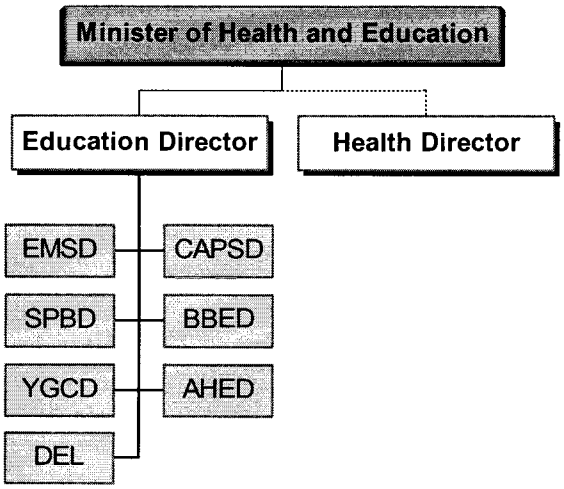


Figure 10 - Structure of Education Sector

The Directorate of education directly administers and monitors Sherubtse College, the only college of higher learning in Bhutan. It also monitors the two teacher training colleges, the Institute of Language and Cultural Studies and the National Institute of Disabled. The District Administrations are responsible for the administration and supervision of the respective primary, community and secondary schools at the district levels. The Directorate is responsible for curriculum and academic related matters. The district education officer (DEO) who directly reports to the District Administrator for administrative issues supervises all primary and secondary schools in the district. This system of administration and supervision is common for all social sectors in the districts.

Non-formal education is also promoted in the country. Large fractions of the rural population are illiterates. Non-formal education is designed to reduce this

percentage. The 6 Non-Formal centres with less than 300 learners in 1992 has expanded to 146 centres with over 5,000 learners in 2000. Considering the age of the enrollees and the short time available they can spare, only basic literacy is taught in these centres.

Evolution of modern education system

Until the 1950s the only formal form of education in Bhutan was the monastic education system. Modern education was introduced in the country during the early 1950s. While monastic education still remains very important in religious institutions, modern education system is promoted and expanded since the inception and start of the first five-year plan in 1961. Within four decades, Bhutan has been able to create an established education system. The number of schools/institutes has consistently grown over these decades as shown in figure 10.

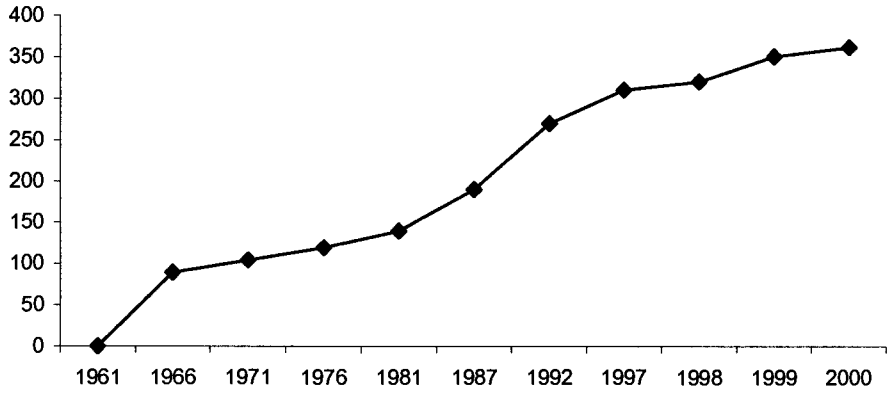


Figure 11 - Growth of number of schools

The number of enrollments in schools and institutes also continue to grow. From an approximately 20,000 students in 1976, the number has reached to almost 120,000 enrolled students in 2000.

Expectations from the Bhutanese Education System

The Bhutanese education system is designed to meet and fulfill children's all round development and pursues to provide wholesome education to the children. Schools in Bhutan shoulder a broad range of social, organizational and community roles. They are designed to teach students to identify individual, group and community issues and problems and solve such problems by comprehending knowledge and models they learnt in schools.

The vast resources and opportunities available through and as a means of ICT can be exploited. Students can take active and constructive parts in their learning process. Most of the children in Bhutan have not even seen a computer. The expectations and capabilities as far as ICT is concerned are therefore, limited in the Bhutanese context of exposure and knowledge. The process of educational development however, intends to overcome this techno-knowledge

backlog. Policy makers are also aware of the risks of overburdening our children in the process. The focus of the sector on sustainability and self-reliance values guide the whole process of education in the country. There are many rural people moving into towns and other urban centers in search of work. Bhutan is concerned about this migration. With various limitations on industrial development, employment opportunities in Bhutan will remain limited. Infrastructure development to create opportunities for people and for economic development will need huge investments. The appropriate and timely educational policies on ICT, therefore takes care of this looming economic and social problem. Investments in the development of ICT are comparatively lower. Reaching ICT to schools will have far reaching and long-term benefits. Bhutanese students will learn computers and other services of information and communications technology. This knowledge will prepare children to be independent. It would also encourage entrepreneurship development. ICT is recognized as a revolutionary industry that will benefit the education sector tremendously.

Present Scenario

There are different levels in the Bhutanese education system.

- Primary and community schools in the villages and geogs
- Secondary schools in towns and urban centres
- Pre-universities in a few locations
- Undergraduate programs in five higher colleges
- Institutions as a separate entity or class of vocational education

Students normally take up training programmes in the vocational institutions after secondary education and pre-university. The Bhutanese education system has evolved from the Indian system of education. There are no Universities in Bhutan and Sherubtse College is affiliated with Delhi University in India. A National University will be established very soon.

Table 2 shows some school statistics for 2000.

2000 figures

A. Schools and Institutions				
SN	**Schools/Institutions**	**Number**	**Enrollment**	**Teachers**
1	Community Schools	151	17,335	367
2	Primary Schools	110	32,744	750
3	Junior High Schools	59	40,508	1,028
4	High Schools	26	17,481	614
5	Private Schools	8	2,449	108
6	Institutes	7	1,824	159
7	Non-Formal Education	146	5,372	

Table 2 - Education Statistics

Though the student to teacher ratios at various levels of education institutes have consistently improved over time, it is recognized that much needs to be done if Bhutan is to move and achieve wholesome education. There is a shortage of

teachers mainly for science and mathematics and thus will be in ICT as well. As such, there will be continuous flow of expatriate teachers primarily from India for foreseeable future. The education policy takes note of the need for more Bhutanese teachers. An effort has been made to replace expatriate teachers. The percentage of non-Bhutanese teachers has gone down substantially since the early-1990s. Today 19% of our teachers are non-Bhutanese compared to 33% in 1992. With ambitious plans to introduce computers in the curriculum and the appreciable growth of student enrollments, this requirement for Bhutanese teachers will be more severe.

Curriculum and education structure

Table 3 shows the distribution of subjects in the Bhutanese education curriculum.

Area	Subjects	Primary Education							JHS		HS	
		PP	I	II	III	IV	V	VI	VII	VIII	IX	X
Language	Dzongkha											
	English											
Mathematics	Mathematics											
Science and Technology	Science (integrated)											
	Physics											
	Chemistry											
	Biology											
	Computer Science											
Human Society and Environment	Environment Studies											
	Social Studies											
	History											
	Geography											
	Economics											
Creative and Practical Arts	Visual Arts and Craft											
	Songs, Dances and Music											
Health, Physical Education and Personal Development	Health & Population Education											
	Games and Sports											
	Moral and Value Education											
	Scouts											
Socially Useful and Productive Works	Agriculture and Social Forestry											
	SUPW											
	Basic Skills											

Learning areas with specific subjects and periods.

Learning areas addressed in programmes

Table 3- Bhutanese education curriculum

The primary and secondary systems are designed to provide basic literacy and mathematical skills. Bhutanese history, geography, culture and tradition also form an important part of the classroom teachings.

Fundamental concepts of health, agriculture, population and environment form important aspects of the syllabus. There are large numbers of outdoor activities in schools. The new system of activity-based learning centrally based on environmental and cultural foundations forms a very important part of the Bhutanese education system from the very beginning. Subjects like Bhutan's history and geography were incorporated into the higher schools syllabus during the past couple of years.

ICT in Education

The advent and development of Information and Communication Technology has influenced many aspects of the Bhutanese way of life since the establishment of Druknet. The level of ICT penetration in the education sector is low. Two weak areas in ICT are the lack of adequate infrastructures and human resources.

Headquarters

There are at present 49 computers in the headquarters of the Education Division. Many of these computers are networked. These computers are not used optimally. The drawbacks to this are unavailability of relevant softwares in education management and lack of adequate ICT personnel. 75% of computers in the education division are connected to the Internet. It is anticipated that the available computers will be used efficiently as more knowledge and experience are gained in the use of computers and Internet. The education division has a website of its own (www.education.gov.bt).

Schools

Bhutan has hundreds of schools at various levels, community, primary, junior high, high and the college education. There are no computers at the primary schools. Of the 29 government high schools only 5 have more than 10 computers. Only 29 out of the 59 Junior High Schools have one computer each. The use of even this small number of computers has limitation of efficient power supply. There is a total of 104 computers in high schools. Most of these computers are concentrated in 11 high schools only. Even the two teacher training institutes have only 30 computers in total. None of the government high schools have LANs. Contrary to this, all three private high schools have more than 10 computers, networks with access to Internet. Some of these private schools have also started optional computer classes.

Sherubtse College

Sherubtse College in Kanglung started a 3-year long Bachelors of Computer Applications course in 1999. Computer courses are also offered as one of the subjects in other Bachelors programmes. It is felt that the syllabuses of these programmes will have to be updated to keep up with the development in the ICT field.

There is a strong desire to connect the College to Druknet through a dedicated leased circuit but due to some technical problem in the telecommunication

network in Kanglung, this has not been successful as yet. Sherubtse College will have its own web presence. Distance education programme is one area that would be explored. The present Internet connection through dial-up system is inadequate for the only college of higher education.

Royal Institute of Management

The Royal Institute of Management, RIM started a one-year computer course in 1984. This programme was substituted with a 2-year Diploma in Information Management Systems in 1996. RIM also conducts and coordinates a number of ad-hoc short-term computer courses as per demand. Computer and Internet courses are also incorporated in management programmes. RIM works closely with the Asian Institute of Management, Philippines in developing and conducting its courses.

At present, RIM has 95 computers that are all connected to a network. A 64 kbps leased line connects them to Druknet. RIM has a web of its own (www.rim.edu.bt). The computers to employees ratio in RIM is 0.74, one of the highest among Institutions. It has also developed a number of useful in-house applications, such as the training, staff and payroll information systems. It has its own IT Unit to manage and maintain the section.

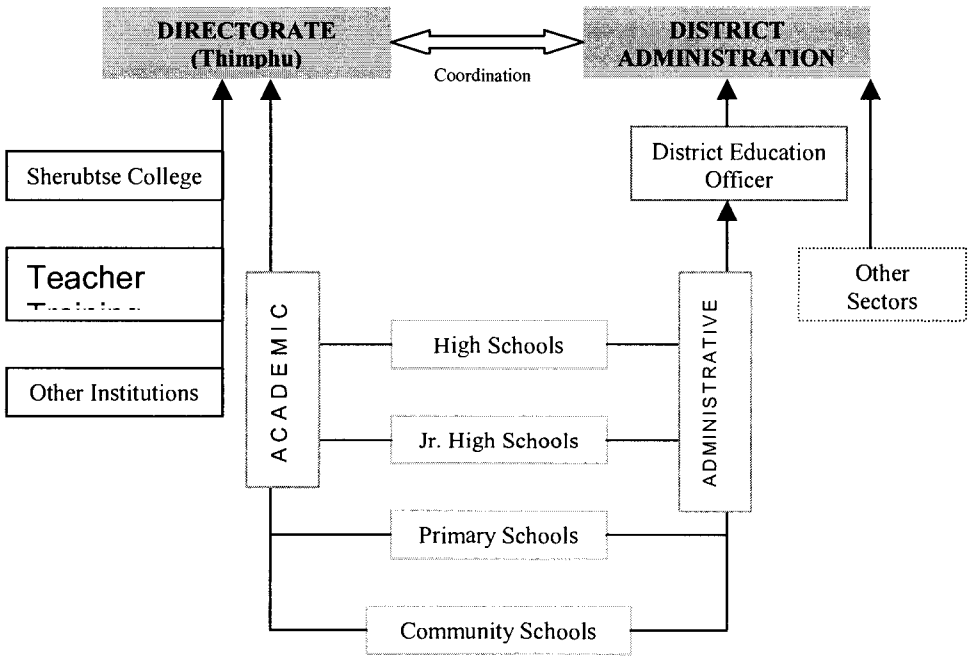


Figure 12 - Management Structure of schools

ICT Strategy

82% of the Internet usage time is spent in e-mails in the education sector. Given the absolutely low penetration of Internet in schools around the country, it can be inferred that not much of this percentage is dedicated to official correspondences with schools. It is however encouraging that people using Internet in the

education sector do spend lot of time downloading materials and information that would benefit the education system.

The following is the SWOT analysis of the Education sector.

SWOT Analysis

Strengths	**Weaknesses**
▪ Strong English language capability ▪ 5 high schools and all private high schools have enough computers ▪ Adequate penetration of education system around the country ▪ Very ambitious ICT Education Master Plan ▪ Appropriate organization structure to address ICT in education ▪ Sustained government support	▪ Teachers not trained in ICT and computers ▪ Quality teacher education needed ▪ ICT curriculum is static in teacher institutes as well as in schools ▪ Education syllabus does not prioritize ICT education ▪ Very few schools have computers
Opportunities	**Threats**
▪ Would create employment ▪ Distance Education will close the education gap ▪ ICT products can be produced by students as projects and encourage business ▪ Students can communicate with other students from outside ▪ Education network will save costs ▪ Intranet in each school ▪ Will keep students upto date with technology ▪ Students will be competitive in job markets ▪ ICT literate children as agents of change in the country	▪ Not enough budget from government ▪ Donor assistances not continuous ▪ Sector might be left behind Technology ▪ Electricity supply inadequate in all schools ▪ Inadequate maintenance people ▪ Lack of softwares ▪ Lack of funds for Internet subscription

Policies on ICT have emphasized the need to make ICT a tool for efficiency and faster development. Government policies emphasize that it would also develop the private sector and promote empowerment of people. The pyramid structure of our education system produces children at various levels of academic literacy. One of the strongest qualities of Bhutanese education system is the command

that our children develop on the English language. This is true for almost all levels of the education system.

Therefore, Bhutanese schools are ideal institutions to promote ICT related activities. Children have been very eligible agents of change in the country over the years. If adequate and appropriate facilities and guidance are provided schools can continue to play this crucial role in the future too.

The ICT curriculum and infrastructures in the Teachers' Education institutions and tertiary schools are poor. Teachers have to be adequately trained and familiarized on ICT for them to be able to provide a meaningful education to the children. Some basic computer applications and systems that are available today in some institutions and schools have to be overhauled and modified so that a firm and efficient education intranet is established nationwide to benefit everybody at stake.

ICT Master Plan for Education

The education division has prepared an IT Master Plan for Education. The 9 packages of the Master Plan are briefly described below.

Package 1

ICT services for immediate use will be established in the 2 teacher training institutions in Samtse and Paro. Lecturers and student (future teachers) will be familiarized on Information and Communications Technologies. Preliminary works on distance education will be started.

Package 2

Activities from package 1 will be continued. Use of online resources to enhance the knowledge of lecturers and students alike will be promoted. Distance education will be fully implemented with all resources and infrastructures. A dynamic web page will be developed for distance education. Computer courses will be introduced in teacher training programmes. One-year Post Graduation Certificate in Education in Computer Science will be introduced in these institutes.

Package 3

There are 2 categories of high schools. One with classes upto 12 and one with classes upto 10. Computer Studies as an optional subject will be introduced in 10 high schools with class 12. All teachers and students in these schools will be trained in ICT. Internet will be provided to these schools and individual school homepages developed. Using computer, Internet and networking facilities will improve teachers' delivery and school's administration.

Package 4

Computer Studies as an optional subject will be introduced in the remaining high schools. All teachers and students in these schools will be trained in ICT. Internet will be provided to these schools and a school homepage developed. Using computer, Internet and networking facilities will improve teachers' delivery and administration.

Package 5
25 Regional Resource Centres, RRC for education will be established to provide up-to-date information for teachers of the cluster schools. These RRCs will function as a link between the cluster schools and other agencies including the education division itself. This centre will function as a resource node where teachers can share teaching materials and other resources within themselves. Teachers will be trained on new technologies in these Centres.

Package 6
Internet will be provided to 36 Junior high schools that have electricity. Teachers and students will be trained in ICT. Adequate ICT materials as teaching resources will be arranged. School management and administration will be enhanced through efficient use of ICT.

Package 7
Internet will be provided to 34 Junior high schools that do not have electricity. Teachers and students will be trained in ICT. Adequate ICT materials as teaching resources will be arranged. School management and administration will be enhanced through efficient use of ICT. Where required arrangement for power supply will be arranged.

Package 8
Basic ICT literacy and education will be introduced in 50 primary schools that have electricity. Teachers will also be trained in computers and Internet. Internet services will be provided in the primary schools. Instructional delivery and school administration will be improved by exploiting the facilities.

Package 9
Basic ICT literacy and education will be introduced in 100 primary schools that do have electricity supply. Necessary power supply facilities will be arranged in these schools. Internet services will be provided. Teachers will also be trained in computers and Internet. Instructional delivery and school administration will be improved by exploiting the facilities.

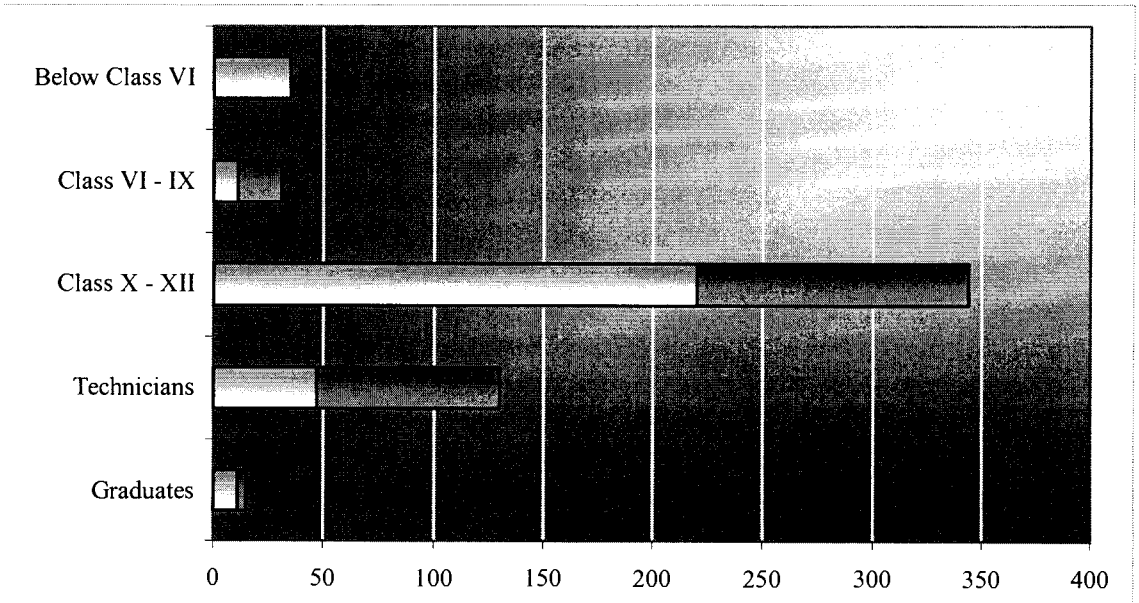
Comments on the IT Education Master Plan
The IT Master Plan for Education is a broad statement of desires and visions. Bhutan is a landlocked and mountainous country. Communities are sparsely spread. The strategy of the government to locate small community schools around the vicinity of the rural households has given rise to the equal spread of schools and institutions.

The plan is ambitious and covers all entities of the education structure. The plan to introduce computer courses in the teacher training institutions and the high schools is appropriate. Due to immense logistical difficulties, ICT provisions in Junior High Schools, Primary Schools and Community Schools may not be feasible for quite sometime. There are a number of reasons for this. The 5-years duration of implementation is too short. There are other technical difficulties for implementation in rural schools. Electricity and telecommunications are still not available in many parts of the country. Provisions of these services will need huge investments. Given the weak teachers' training curriculum in ICT related

subjects, enough ICT literate teachers may not be available within such a short span of time. There are a small number of technical human capacities in the education sector to spearhead the implementation of the project. Equipment and facilities might have to be replaced sooner than expected. Maintenance and operational costs will be substantial and these costs are not indicated. The IT Master Plan for Education will have to be modified and reviewed in tune with the strategies that participating agencies. Despite clear separation into unique packages, many relevant factors will have to be considered. The Master Plan guides in its macro-dynamism and individual package projects will need to be developed to give more detailed information and direction.

Employment issues

Figure 12 indicates the first half 2001 registered employment data. The Division of Employment and Labor is making efforts to generate awareness of employment. The government needs to move faster towards adopting various laws directly or indirectly meant to encourage homogenous employment opportunities around the geographical extremes of the country.



	Graduates	Technicians	Class X - XII	Class VI - IX	Below Class VI
Female	4	83	124	20	0
Male	11	47	220	11	35

Figure 13 - Six-month Registered Unemployment

Employment issues are today coming to the limelight of the Bhutanese policy makers. The grim reality that the job market is flooded by expatriate work force is a concern for all. While large number of people come in search of better working conditions and earnings to Bhutan, more and more Bhutanese are also entering

the job market. However, there is growing inconsistency between the increase in job seekers and the availability of jobs in the market. This mismatch is a major concern. As can be seen from the graph above people who have attended class X to XII are the majority of job seekers. This should be the target group for any government intervention in solving the unemployment issue.

CHAPTER 10 HEALTH SECTOR

The Health division is one of the two divisions under the Ministry of Health and Education. The health sector primarily has three tires or levels of administration and operation namely:

Primary	Basic Health Units and Outreach Clinics (villages)
Secondary	District and town hospitals (urban level)
Tertiary	National and Regional Referral Hospitals (national level)

Table 4 shows the basic health datas in Bhutan.

Description	Number
Hospitals	28
Basic Health Units	145
Indigenous Hospitals	1
Indigenous Units	13
Training Institutes	3
Outreach Clinics	454
Total Hospital beds	1,023
Population per bed	622
Bed per 1,000 people	16
Total **doctors**	107
District health officers	20
Health Assistants	153
General Nurse Midwife	150
Auxiliary Nurse Midwife	125
Assistant Nurse	192
Basic Health Workers	182
Technicians	229
Compounders	24
Malaria workers	41

Table 4 – Basic health data (1999)

The number of health centers and hospitals has constantly grown over the years indicating the priority and importance placed to this sector. The 5-year budget allocation has also increased since first Five Year Plan in 1961. Ninety percent of the Bhutanese population has access to health services.

There were tremendous increases in the budget allocation to the health sector over the last 40 years (Figure 13). Due to the consistent effort of the Royal Government, Bhutanese citizens today enjoy access to adequate health services and facilities. Traditionally, the emphasis was on primary health care system. During the earlier years, much focus and emphasis was made on the eradication of leprosy and malaria. Tuberculosis was also a major problem during the late 70s and the 80s.

The main donors in the health sector are the Royal Government, Government of India, DANIDA, WHO and UNICEF.

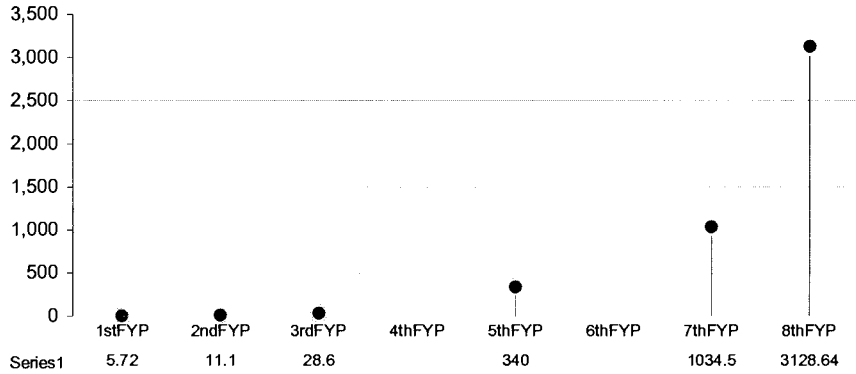


Figure 14 - Budget allocation for Five Year Plans

Telemedicine - Health Telematics

As the use of ICT in health sector would incorporate not only the medical field but technical and maintenance aspects as well, the approach to health services using technology is referred to as *Health Telematics* in Bhutan. It will however, be referred to as telemedicine in this document. The World Health Organization introduced the concept of health telematics in Bhutan. WHO's activities are focused more on primary health. The health sector has constantly been guided with advice on new technologies and new research findings on health around the world.

In 1997, His Majesty the King commanded that Bhutan should explore the benefits of telemedicine. The rugged terrain and the challenging distances make telemedicine a viable solution to consultative health in the country. The government recognizes the need and importance of telemedicine. Many casualties occur in remote inaccessible part of the country due to poor communication and lack of timely consultation. For example, in 1999 there was a major bus accident in the central part of Bhutan. Though local doctors reached the scene on time, proper treatment could not be carried out in the local hospital due to lack of experience and knowledge on such emergencies. It is widely believed that, had the doctor been able to communicate timely with the specialist, a number of lives could have been saved.

In Bhutan, the concept of telemedicine started with the establishment of a telecentre in Jakar, Bumthang. Some telemedicine equipments were donated by the Telemedicine society of Japan to Bumthang hospital in 1997. However, the equipment could not be used due to interface difficulties with the telecom network. These were solved but it was noticed that with only about 9,000 people

visiting the Bumthang hospital in a year (average of 30 patients per day), the usefulness of the telemedicine equipment was not optimum. Moreover due to short distance, many patients preferred to travel to Thimphu for treatment when required.

The telemedicine equipments were then shifted to Mongar Referral hospital in the eastern region in 2000. A dedicated 64kbps leased line was also established in Mongar hospital for telemedicine purposes.

Telemedicine services may not be confined to the medium of microwave radios. There are successful stories of the use of satellite ground stations or VSATs (Very Small Aperture Terminals) for this purpose. As these are expensive equipment, the health sector will not be able to use them for the time being.

Figure 14 shows the schematic structure of the pilot telemedicine project. Dedicated leased circuits connecting all the 28 hospitals are being planned for the telemedicine project. Bhutan Telecom assessment is that at present 17 hospitals can be provided with dedicated lines without any extra costs on related equipment. However, more telecom equipment will have to be bought to connect the remaining 9 hospitals.

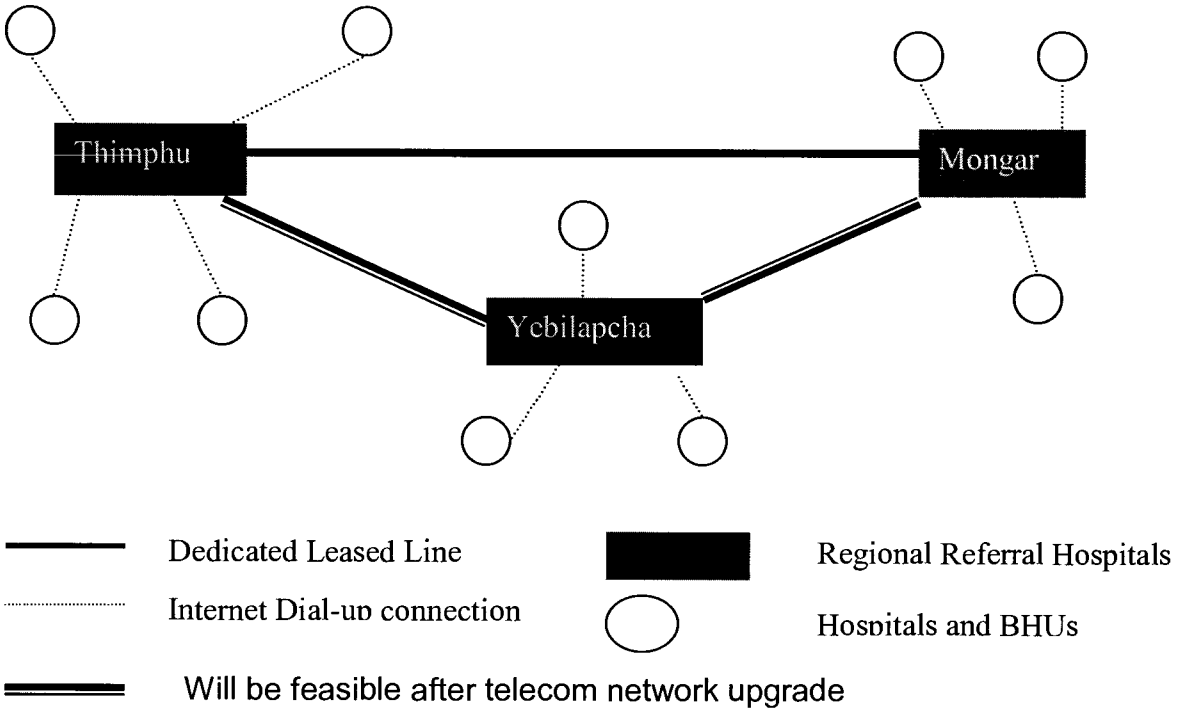


Figure 15 - Schematic diagram of short-term telemedicine network

The Health division has established telemedicine facilities in Thimphu and Mongar hospitals and one in Yebilapcha hospital in Central Bhutan is planned. District and urban hospitals and BHUs could then be linked to these regional

referral hospitals through dial-up systems using appropriate web applications. Figure 8 represents this schematic plan. This would be cost effective and would need much less technical and financial resources for operation and maintenance. To reach the district hospitals and BHUs, appropriate use of web-based applications would be cost effective and suitable.

SWOT Analysis

Strengths	**Weaknesses**
▪ Hardworking staff ▪ Organizational experience with ICT ▪ Good donor support including WHO ▪ Enough equipment at headquarters ▪ Supportive leadership ▪ Telemedicine pilot project in progress	▪ ICT equipment only concentrated in headquarters ▪ Health Staff do not have enough ICT experience ▪ ICT staff do not have health knowledge ▪ Lack of health record codification and standardization
Opportunities	**Threats**
▪ Improving health extension and services around the country ▪ Record health coverage ▪ Diversification of health services ▪ Improved recording and retrievable system in the headquarters ▪ Basic distance diagnostic and analysis already in place ▪ Benchmark study on digitized X-ray and ECG already realized ▪ More public health education ▪ Costs will be saved on referrals	▪ Unstable power supplies in many of the hospitals ▪ Standardization of patient data not possible for young patients as ID cards only issued at 15 years of age ▪ Acceptance of ICT systems may be difficult to traditional methods

Health ICT Strategy

The first step to health care by using ICT would be to provide computers to the hospitals and BHUs. Where there is no electricity, provision of power supply systems such as batteries, inverters and solar panels should also be made. The health division started computerization process very early. Most of the employees in the headquarters have computers. One of the strategies of the health sector from the very beginning has been to maintain a standard computer system including hardware and softwares. The use of computers and Internet is expected to enhance the working of the division to a great extend. However, planning and coordination of any ICT related activities would have to have to done properly. For example, the health data collection system, which is manual and time consuming today, can be computerized. Analysis and inferences can be

automated with appropriate applications. The health information are collected at the BHUs on a monthly basis. These data are normally compiled from the daily patient data. These data are sent to the headquarters every 3 months for compilation and analysis.

Standardization of health information system is another area of strategic importance. This would help standard storage and retrieving of information efficiently and timely. Management decision process will greatly be enhanced as such.

Computers and Networks

There are 3 separate LANs in the health sector in Thimphu; one each in Headquarters, Hospital and in the Health Institute. To use the leased line to the Thimphu hospital optimally, the LANs of the health school and the hospital will be merged very soon. There are at present 44 computers in health division that are networked and 6 of these computers have access to Internet. There are 67 computers in the offices of the District Medical Officer and the District Health Supervisory Officers in the 20 districts. Many of the computers are very old and may not support Internet connectivity. Many of the old computers will be replaced after the dial-up telemedicine project is implemented.

There are 4 ICT professionals in the health division and given the number of computers, this number is adequate. However, this capacity has to be greatly enhanced once the telemedicine projects are implemented. The health division does not have a dedicated circuit with Druknet. With the establishment of a website with assistance from UNDP, a dedicated leased line with be established. Most of the web related activities could be achieved with web-based applications. Data speed can be an issue of concern but with the small amount of health data that is expected to flow at any time, this will not be a serious impediment. Once computers are available in hospitals, small amount of data can still be sent through normal spreadsheet or data files.

There are positive opportunities from teleconferences and on-line health discussions and other resources. Doctors can advise health workers by reading health reports real time. Junior doctors from district hospitals can monitor and observe operation procedures being carried out in the referral hospitals. However, this video-conferencing services will take sometime to implement due to the bandwidth constraints in the telecom network. The pilot project on telemedicine being implemented in three referral hospitals at present will be a good benchmark for future telemedicine projects in the country. Despite questions on cost and technology, the health division is all set to implement this project.

Intensive ICT training will have to be given to all health staff who will be operating the system or applications. Experiences gained at the referral hospitals will have to be shared with the district hospitals. Transferring people who have

experienced at the tertiary level to the district hospitals on a rotation basis will greatly help. This has to be done in a very structured manner so that there will be homogenous process of learning at all levels.

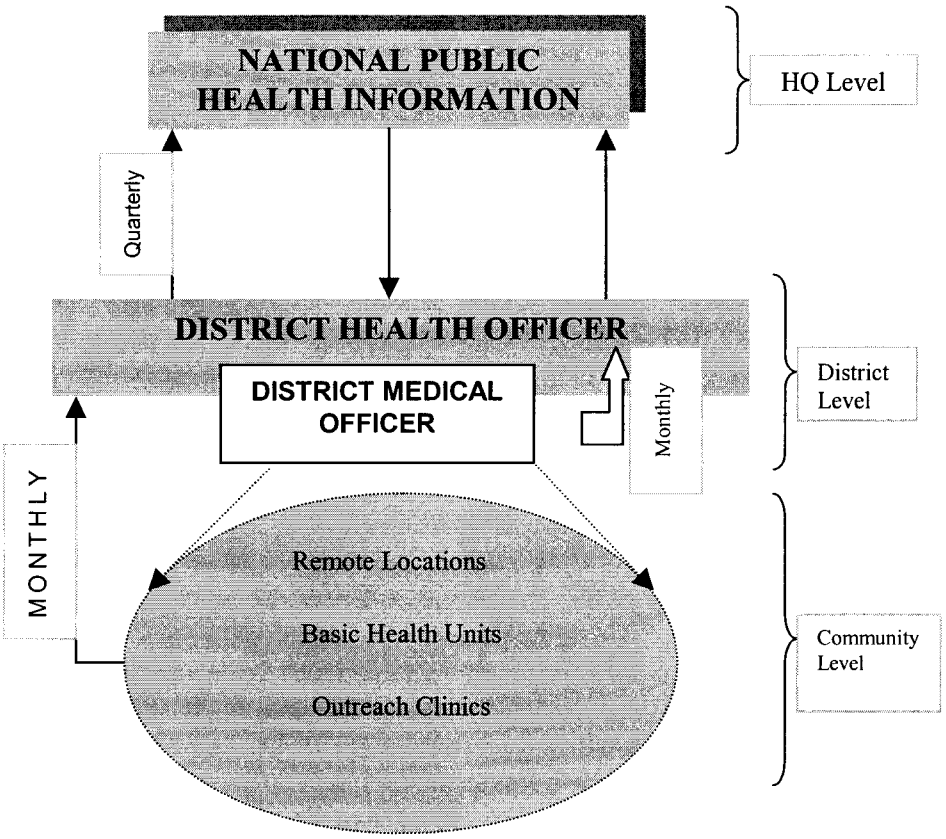


Figure 16 - Schematic diagram of Health Information Flow

Drawbacks to Telemedicine

According to Bhutan Telecom, there are certainly great benefits with telemedicine. However, with corporatization of Bhutan Telecom, the organization is driven by its desire to sell its services. Leased line circuits are a very good source of revenue for Bhutan Telecom. The cost of a 64kbps-leased line at one location is Nu 40,000. Even with enough concessions, this will be huge cost for the health division if it is to implement the telemedicine project in all the districts through a leased circuit.

The Planning Officer of health division agrees that cost will be a point of great concern. The support of donors for a couple of years would not necessarily solve this problem, as it is not anticipated that the government would support such huge regular investment.

There is a big dilemma in the use of telemedicine in a major way in Bhutan. The government recognizes its importance in a country like Bhutan. However, with limited resources the implementation will be difficult. A suitable and sustainable

method of application will have to be developed. Study of similar experiences from other countries will help find a suitable method of its use.

At the present level, ICT can be used to streamline the various information flows. Historical data that are maintained in files can be stored electronically. Appropriate development of health applications will help in storage, retrieval and analysis of important health data. The district health workers can use these information in planning health activities. In doing so, they would need computers and access to relevant applications and softwares. Internet and e-mail access would help them correspond and cooperate with colleagues in their activities. Besides increasing the number of computers and enhancing the access to ICT services, health workers will have to be trained in computers and Internet technologies. Basic knowledge on maintenance of databases applications will help reduce logistic costs.

Computers and Internet in the Health sector will have to be used for enhancing efficient and timely flow of information. Basic features of ICT such as a telephone, e-mail and fax will sufficiently serve the purpose to reach health services to the remote inhabitants. The access to medical professional, facilities and medicines itself may be the priorities of the health sector.

Organization

The Ministry of Agriculture is popularly known as the Renewable Natural Resources sector. This is based on the integration principle of the crops, livestock and forestry sub-sectors driven by the concept of sustainable development in the country. Figure 16 shows the structure of the Ministry of Agriculture. The Minister is the head of the Ministry and he is supported by a Secretariat that is headed by a Secretary. There are five main Divisions under the Ministry, namely the Policy and Planning Division (PPD), Administration and Finance Division (AFD), the Department of Research and Development Services (DRDS), Department of Agriculture and Livestock Support Services (DALSS) and the Department of Forestry Services (DFS). Corporations and NGOs who have RNR activities would come directly under the Secretariat.

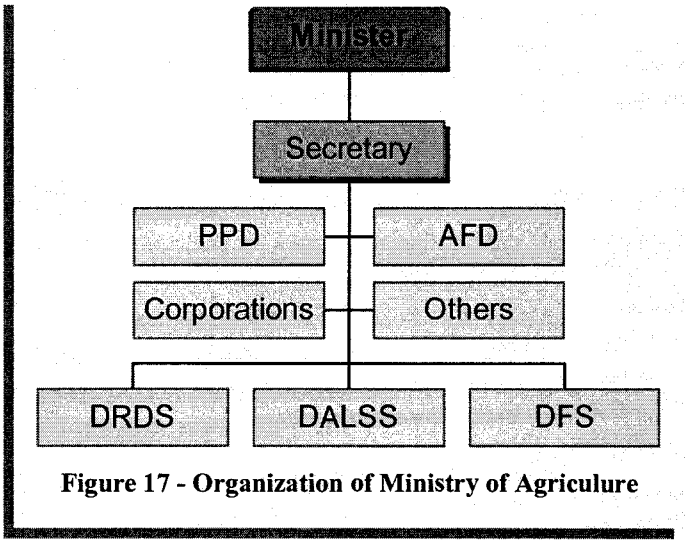


Figure 17 - Organization of Ministry of Agriculure

The Ministry of Agriculture was established in 1985. Over the years it has collected huge amount of RNR data and information particularly from rural areas. These information are invaluable given the importance of data interpretation for planning and implementation of development activities. Much effort was used to collect these data from some of the most inhospitable locations in the country. These data are stored manually and at times in disparate conditions. Lack of proper filing and tracking system has lead to more difficulty in using them for productive purposes. Information and Communication Technology (ICT) thus has been recognized as a suitable technology to address this problem. Valuable information and sometimes critical can be stored in an organized manner in databases and required information can be retrieved when necessary.

Sector Strategies

The RNR sector strategies are based on individual sectoral policies that would maintain natural resources, promote economic growth and development particularly of the rural people and ensure efficient use of resources available and affordable.

Some of the important strategies are:

- Improve the planning base of the various sectors.
- Information is one important requirement for this. Limited data and understanding of the principles of farming system seriously hinders structured planning. Therefore, MoA will strengthen collection, analysis and dissemination of agriculture statistics.
- Regulatory body to safeguard land use, taxation and trade of rural population is necessary and will be established.
- Natural resources shall be conserved at the most possible.
- The revenues earned from forest products shall be used to fund conservation and management programs.
- Self-sufficiency in food grains will be always kept in mind while making any programs or activities.
- The MoA will always involve people's participation in all RNR local decisions.
- The opportunity to increase the income of the Bhutanese communities will depend on access to markets.

ICT and the RNR sector

Much before the establishment of Druknet, the RNR sector with support from the UNDP (APDIP) has already initiated an ICT system in the four RNR Regional Research Centres in Khangma, Bumthang, Bajo and Yusipang. The system used the digital telecom network to access and correspond through dial-up method. A mail server was installed at the MoA headquarters. The system was successful as far as exchange of information through mails is concerned. Real-time data and information could not be exchanged or used due to communication bottleneck. In addition, cost of communication was another serious impediment to its regular and efficient use. These centres had to dial the server at Thimphu through the PSTN lines on a regular telecom charge basis. The costs were enormous given the distance of these centres. Sooner or later the MoA had to spearhead a more ambitious plan of action to use ICT in the most cost effective and efficient manner.

Nine months after the establishment of Druknet, a local area network (LAN) was installed in the headquarters of the Ministry. This was the first LAN ever installed in the government sector in Bhutan. This was a great achievement for the Ministry then. Officials agree that after the establishment of this LAN, work efficiencies of the officers and workers have certainly improved. Paper works have been drastically reduced.

A 64 kbps leased line was made available through Druknet under the assistance of the UNDP and DANIDA. According to officials, the provision of the leased line was the greatest contribution Druknet has made to this sector. This open communication platform enabled the Ministry to reduce communication costs. Officers were browsing the net and downloading valuable information and education materials.

In line with the developments in this field, a 10 members task force was formed in March 2000 to work on the future direction of ICT in the Ministry. This task force was mandated to develop an information management system in the Ministry and would address the problem of inaccessibility and unavailability of data and their productive use then.

Information Management Systems Plan, IMSP

The IMS Plan is a five-year plan that deliberates on how the Ministry would use ICT to manage information. A coherent and consistent information system framework was necessary and the task force was geared up to address these issues. The IMS plan is a tool to give direction to optimize the use of the available resources. Issues like food security, conservation of resources, enhancement of rural income, and social balance are also being addressed.

The MoA plans to use web technology to manage content and delivery of information to all levels of users. The four Renewable Natural Resources Research Centres will benefit from this technology. Today the MoA's website (http//:www.moa.gov.bt) serves as the information portal for most of RNR information in the country. Various divisions, sections and units will always input important and useful data into the server so that they are publicly available.

An INTRANET for use by internal staff of the Ministry will be established on top of the MoA's web server. This will enable messaging, use of groupware applications, internal discussion forums and file sharing.

ICT Professionals in the Ministry agree that there are tremendous benefits in using web technology. The most important being the use of limited softwares primarily the available browser softwares like Internet Explorer or Netscape Navigator. Web browsers have advantage over other softwares in that they can integrate text, graphics, audio and video intelligently. The other benefit or advantage that it would bring is in the cost. Costs will not be incurred in leasing a number of dedicated circuits. The only requirement to access this vast information is a dial-up account with Druknet. Officials rightly agree that this would cut costs many folds. On the subject of security, RNR information are not considered sensitive information that would make managers uncomfortable.

Each division, section or unit will be responsible for content development of their respective offices. The following are some of the information systems that will be loaded into the web server.

- Commodity information system
- RNR Statistics information system
- Publications information system
- Agro-meteorology information system
- Forest management information system (in progress)
- Biodiversity information system (in progress)

- Breeding information system
- Pasture and fodder information system
- Research management information system
- Extension information system
- Irrigation information system
- Library information system
- Personnel information system
- Accounting information system
- Property information system
- Farm profile information system
- Laboratory information system

The segregation of the information into many heads has many advantages. First, it would isolate and refine information in individual fields. This step would cover all sections of the sector which otherwise would be left out. There are many types of users for these information systems. The RNR sector covers a wide range of development fields. Though the ultimate users or beneficiaries may be the same group, implementation sections and workers almost completely work in separation. This is where the use of segregated information would be useful. The input of information into separate systems will be easy for management as well.

Though the information system and database developments are quite weak, the Ministry intends to enhance these through several capacity building measures. Relevant officials will be trained in database input and management, basic application development and basic Information and Communications Technology. The Ministry, however, expects to receive substantial assistance to realize this goal through technical assistance such volunteers, consultants, software development or information management systems.

The MoA Enterprise Network, MEN

With a dedicated 64kbps leased line to Druknet, a professional web presence, a team of little but dedicated ICT professionals, a promising ICT plan of action and a good network, everything sets ready for the Ministry of Agriculture to embrace ICT to fulfill its goals and objectives. Two local area networks are already in place in two of the research centres and the LANs in the other two will be implemented soon. The MoA headquarter already has a network and the completion of LANs in the 4 regional research offices will complete the MoA Enterprise Network. This would lead to a centralized and decentralized computing system. Figure 17 shows the conceptual 3-tier interconnected Enterprise Network of the Ministry. It would use TCP/IP protocol over ISDN lines as the backbone. The first layer is the core LAN at the MoA headquarters, the second layer is the RNRRC LANs at each of the 4 centres and the third layer is the Dzongkhag level connections that would include offices of the District Agriculture Officers (DAO), District Animal Husbandry Officers (DAHO) and the District Forest Extension Officers (DFEO). The offices in the third layer can access and transfer data and information to and from their offices.

The LAN at the MoA headquarter was completed in February 2000. There are 3 servers interconnected by high-speed CAT5 cables. It is a high grade LAN that has capability to connect upto 1,000 workstations without any data degrades. At present there are 240 computers in the Ministry of Agriculture. Most of these computers were bought during the last 2 years. With a ratio of 0.06 computers per employee, much needs to be done in improving this ratio. 27.5% of the computers are networked today and 29.58% computers in the whole Ministry have access to the Internet. This is a wide usage compared to most of the other Ministries. Computer that are standalone are used for RNR statistics, land use and market information and other desktop publishing works.

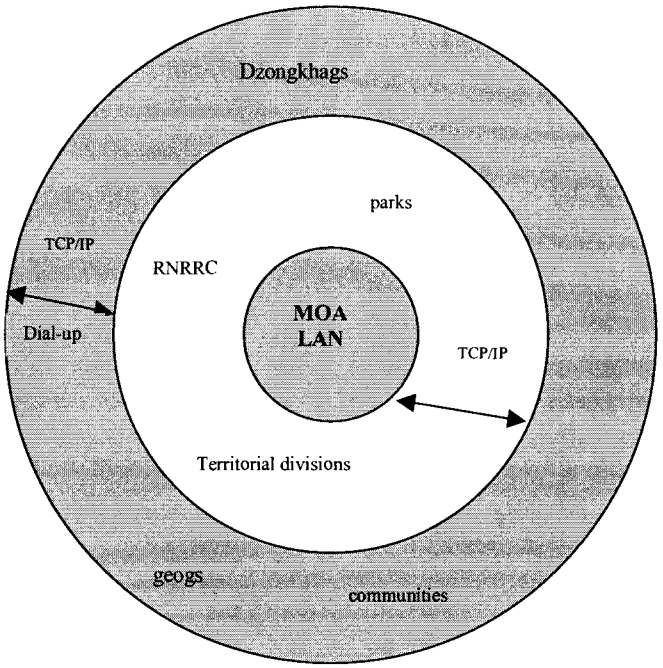


Figure 18 - MEN structure

All the 4 RNRRCs will have LANs very soon. The regional centres will function as central nodes in the respective regions. Territorial Divisions and Park Offices will be connected to RNRRC nodes or directly to the Headquarter server through dial-up systems. The third tier users will have computers and modems to connect to the servers through a dial-up system. Some of these offices are already using Internet.

There is small number of ICT personnel in the Ministry and there are no efforts to strengthen or increase the capacity. This is deliberate. The ICT functions and activities will be associated with individual divisions and sections. There will be a working group to oversee the progress of activities in the ICT activities. Though it will away from the actual ICT management, a web development team shall be responsible for the Ministry's web. A database management team will be responsible for development and maintenance of organizational database and information system. A geographic information system (GIS) will implement GIS projects.

CHAPTER 12 PRIVATE SECTOR

The philosophy of Gross National Happiness places the private sector in a position to examine it within the context of the Kingdom's own realities in order to evaluate the potential to contribute to country's economic development [Vision 2020]. Historically, Bhutanese have been barters for a long time in history. Even in the 1960s local villagers or merchants carried out the primary form of trade. Handicraft and agriculture products were marketed house to house within a closed community. Inter-regional trade took place in a very small way. Petty traders worked as middlemen to facilitate these inter-regional trades. There were no roads then and the only form of transportation of goods was by use of mules and horses. Long-distance trades were normally carried out by a small number of traders who walked to Tibet, Nepal and India.

The earliest signs of private sector enterprises emanated since the first five-year plan period. Private sector includes privately owned enterprises and those enterprises where the government holds less than 50 % stake. The first industries were established in the 1970s in the border town of Phuentsholing, Samdrup Jongkhar and Gelephu. The government in then 1980s started big joint venture enterprises. The private sector was continually engaged even in these big projects. Slowly the private sector started to work on big projects. The high priority given to private sector development in the 6th Five-year plan was a big boost. Government divested much of its holding equities of big enterprises in the form of private stocks. Privatization of government enterprises is still pursued. All legal frameworks were also developed to promote this sector.

In an effort to encourage and facilitate private sector development, the Bhutan Chamber of Commerce and Industries was established in 1981. Today more than 80% of the industries and enterprises belong to the private sector. Many of the manufacturing and mining industries also belong to the private sector. Employing more than 77,000 people, the enterprise sector is the biggest employer. A large percentage of these employees are non-Bhutanese workers.

ICT Objectives

The long term ICT Objectives of Bhutan pertaining to the private sector are:

- To have an established, strong and vibrant private ICT industry
- The private sector shall exploit all business opportunities to tap the lucrative ICT markets
- The private sector shall develop credibility in exporting world-class and high quality softwares and earn revenues
- The ICT private sector shall be highly respected sector that shall provide employment opportunities to youths

ICT and the Private Sector

The first computers were brought into Bhutan in the early 1980s. The Computer Support Centre, CSC (a government enterprise) was the sole provider of ICT equipment then. The CSC ordered, processed, installed and maintained computer systems. The government deregulated the ICT sector and soon many ICT vendors and firms were established. The unavailability of skilled ICT professionals was a major factor contributing the poor progress in the development of the ICT private sector.

Peljorkhang Enterprise – The biggest ICT Enterprise in the country

Peljorkhang Enterprise, established in 1993 is one of the biggest companies in the ICT sector in Bhutan. It has grown from a 2 men computer-selling vendor to a company that employs 40 people. Peljorkhang is a business partner and dealer for many of the popular IT companies like Dell, Microsoft, American Power, HP, Sony and Khurana.

One of the driving business strategies of Peljorkhang is "total solution". The company suitably has a sales, service, marketing and consulting departments. Recruiting and retaining Bhutanese ICT professionals is the core policy of the company. It is one of the first private companies to introduce a Company Service Manual in 1997. Besides ICT professionals, Peljorkhang recruits MBA graduates from top business schools in India. 40% of its work force is technical people.

After the establishment of Druknet, Peljorkhang has restructured its activities to meet and fulfill demands in Internet and networking. Its cabling system has also earned the ISO 11801 Class D standard certification.

With the introduction of Internet in Bhutan, the company has witnessed higher productivity, growth and optimized operation costs. The company solely relied on the traditional form of communications such as fax, post and mail. Despite incremental growth in revenues, communication costs(table below) is approximately stable

1996	1997	1998	1999	2000
288,000	373,000	324,000	350,000	360,000

Peljorkhang endeavors to provide world-class ICT products and services. It has identified the following areas to focus its business in future;

a. Establishment of district ICT centres so that it can train people and conduct workshops and seminars on ICT.
b. Demonstrate computers and Internet in schools in particular.
c. Establish Internet Cafes and provide accessibility to people.
d. Provide infrastructure, hardware and software packages to remote districts.
e. Assist districts, geogs and sector offices in establishing networks and intranets.

In the earlier years, popular brands such as Acer, Dell, Compaq and Apple computers were very popular. Locally assembled brands such as Druk and VajraTech did not pick due to poor backup services. The other factor being that government was the major buyer in the 80s and 90s and organizations preferred

good and popular brands. Policies do indicate that local assemblies will encourage private sector development and further enhance employment opportunities.

From a public servant to the proprietor of the First Internet Café in Bhutan
A first person account by Mr. Umesh, Proprietor, Info-Tech Systems

After I finished my post-graduate programme in Computer science from the United States, I started my career as a computer lecturer at the Royal Institute of Management (RIM). The RIM is an autonomous organization and is the only institute that caters management training including Information Technology in Bhutan. After a few years in RIM, I started looking for more opportunities to develop my career. It was then that Internet was introduced with the establishment of Druknet. I started to feel that faster adaptation to development should be through Private Sector. Bhutan has a very pathetic private sector in the IT sector and this was the main reason that drove me to leave my job and start an Internet Café in Thimphu.

I feel that the establishment of Druknet was a great step in the country. I realized that many people started to use Internet in a frenzied excitement. This gave more boosts to the use of computers.

In Bhutan, the private sector will be the major provider of IT related services and the government and corporations would remain a major user for a foreseeable future. The less bureaucratic structure of private sector enterprises makes this more possible. Income and competition are the main drivers for the private sector involvement in this sector or business.

Business has not been very good over this period. Too many players entered the market with fierce competition and in lure of the small number of users. Market has not matured. Sometime people come to "see" Internet in my office not to "use". Many people are still ignorant of this revolution. Today demand is more on basic things like office efficiency softwares, basic Internet and e-mails and not on real hard IT stuff. Systems like LAN and WAN are just beginning to take shape.

The future of Internet is great. Bhutan will have tremendous benefits from this. There is lot of awareness today. Computers and other IT systems were never a priority in the past. Now I realize that every organization considers IT as an integrated part of their management and operational systems. This has become a mandatory tool. The difficult terrain and the inefficient communication systems make this requirement more imminent and immediate.

Internet Cafes are still not very much viable. Bhutanese people still question the logic of spending money in surfing the Internet. I observe more people are going for home computing. Tourists are the main users of Internet but with such a small number of them coming, this certainly is not a target market for me. Many people feel that Internet charges in Bhutan are exorbitantly expensive. In fact, some term this as the most expensive place to use Internet in the world. They do however; appreciate the speed and quality of Internet service.

Organizations, enterprises and agencies in Bhutan very seldom use professional applications. Consultants or freelance national programmers introduced the few tailor-made applications. They lack standardization and quality. Private software companies were almost non-existent till a couple of years ago. The influence and

engagement of non-profit driven enterprise like the CSC was a major factor in discouraging private sector. The absence of Intellectual Property Rights in the country facilitated softwares copies and business in this sector was virtually nil. Even the development of Dzongkhag fonts was done outside.

The following table shows a list of some prominent ICT vendors in the country.

- InfoTech Enterprise
- Druk Computers
- NT Technology
- Peljorkhang Enterprise
- Rigtse Computers
- Sherpa Consultancy
- STCB
- Zambala Electronics
- Dhendup Informatics
- Handy Man's Sales
- PD Electronics
- Sherig Khang
- Sonam Choeki Enterprise
- Ugen Trading
- CyberTech Inc.
- Pe Khang Enterprise

In the 1980s and early 1990s, the CSC was the sole provider of ICT training and support. After the establishment of the Royal Institute of Management, computer related trainings were moved out of the CSC umbrella. Some of the reasons for the discouraging private training institutes were: training needs already fulfilled by CSC, profit margin is low, lack of ICT trainers and lack of government recognition after training from private institutions.

The deregulation of such training institutes helped the establishment of a number of private institutions. According to Umesh Pradhan of InfoTech Solutions, a leading ICT private training enterprise, the training market was obviously very promising particularly after the digitization of the telecom network. However, a number of training institutes came up together giving way to fierce competition.

There is an immense need for ICT professionals in the country. Implementation of national Master Plans for various sectors such as the ICT Master Plan, IT Master Plan for Education, the RNR Enterprise Network etc. will create huge markets for ICT professionals. There will be equally good demand on ICT consultancy services in the country. These would create good opportunities and avenues for the private sector. For now, human resources in the private sector will have to be strengthened. Government will have to play a very crucial and important role at this moment. One strategy for this ICT stimulation could be the distribution of coupons to students, youths, businessmen and others. These non-cashable coupons may be used in Internet cafes, telecom exchanges and even in private offices.

There are also many initiatives being proposed:

1. The DIT shall work as a pre-qualification node for private ICT suppliers and vendors
2. There shall be standard system of business in the ICT products and services

3. The regulations on foreign transactions shall be facilitated by the government to make payment procedures smooth and efficient
4. The government shall spearhead in developing human resources in the ICT sector
5. Rural communities shall be provided subsidized or free training on computers and Internet
6. A private sector ICT strategy will be developed [Vision 2020, cl. 185]

SWOT Analysis

Strengths	Weaknesses
▪ Tax exemption on computers ▪ Simple procedures for imports ▪ Fully digital telecom network ▪ A growing number of networks ▪ Encouraging growth of private sector ▪ High profit margin	▪ Vendors lack infrastructures and offices ▪ Lack of adequate ICT professionals ▪ Flexible prices open opportunity of exploitation ▪ Relatively high prices ▪ Poor marketing strategies ▪ Small market base ▪ No standardization invites poor quality equipment
Opportunities	**Threats**
▪ Growing private enterprises ▪ Growing demands for computers and Internet services ▪ More computer literacy ▪ Strategic ICT Master Plans ▪ More ICT professionals from outside ▪ More hardware and software professionals coming to market ▪ More telecom penetration to rural areas ▪ Government policies emphasize and encourage ICT growth ▪ Process to WTO membership	▪ Government policy on spares still stringent ▪ Absence of Intellectual Property Rights ▪ Taxes on sales still high ▪ Corruption and malpractices ▪ Slow payment procedures ▪ Inadequate budget

ICT and the Tourism Sector

There are at present 10 computers in the Department of Tourism, an organization that regulates the tourism industry in the country. Only two computers have access to Internet and there is no network. The sector has a modest ICT plan and a modest website has been started.

The tourism industry will exploit ICT to explore and market the lucrative tourism market. Internet will also play a role in promoting the concept of selective and value tourism. Peoples' mindset that Bhutan is a very difficult and expensive place to visit can be changed through this education process.

There are still certain drawbacks in the system; the industry expects that there will be enough flexibility in the tourism policy if this industry is to succeed in a long run. The government is also well informed of the many disadvantages of having uncontrolled flow of people coming into Bhutan. Environmental issue is of grave concern to the country. The industry sees Internet as an important medium to education people who desire to visit Bhutan.

The exploitation of ICT in the tourism sector is done in a much different manner. The use of credit cards is absent in the Bhutanese banking system. One still cannot book or confirm flights to Bhutan over Internet. But as policies turn out in favor of this industry, there will be tremendous use of the Internet and other ICT technologies in the future. The mere growth of Internet traffic and revenue (despite reduction in tariff) can confidently be attributed to the growth in this sector. Figure 18 shows the flow of tourists for the past 6 years.

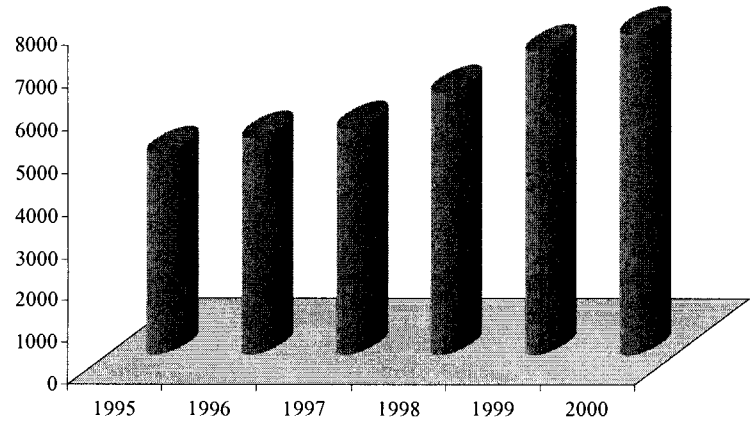


Figure 19 - Tourist Arrivals

Not only the industry, our communities can also use ICT to market themselves to the outside world. On-line visa application processes to reduce administrative difficulties would be highly beneficial. Even if our banks cannot introduce credit card facilities immediately, appropriate arrangements can be made to smoothen up the banking procedures. Opening up accounts in foreign banks can do this so

that people wanting to come to Bhutan can pay directly through their credit cards or banks.

Tourism is one industry that can use ICT in a very productive manner. However, the availability of this facility is not the only factor to promote this industry. There has to be enough support of logistics, resources and policies to make this a success. There are adequate steps being taken to change policies. It is only a matter of time before this industry starts using ICT for everyone's benefit.

ICT and Postal services

With the corporatization of the erstwhile Department of Posts into Bhutan Post, it is expected that various business entities within the organization will be more efficient and sustainable. This drive for efficiency and profit did result in structural changes and layovers. The diversity of business out of the traditional postal carrier is very evident. The organization operates a fleet of transport buses, international courier service, Iternet services, sales of goods and items and also the operation of a mechanical workshop in the capital.

With the successful implementation of Druknet, Bhutan Post has also revitalized its business to digest the ever coming indirect competition to its traditional line of business. A twin networked computer counter service facility has been introduced recently. The Managing Director of Bhutan Post, Dasho Meghraj Gurung accepts that for service industry like the postal services, front-end service and efficiency is the road map to business success. This mini-networked service is aimed to be linked to a major Sectoral network in the future and exploit the benefits that IT has to give.

Bhutan Post is very concerned, however, with the tariff for Internet subscription. They point that, though it may not be feasible for Bhutan Telecom to reduce the rate very much, this stand cannot be maintained at the cost of service to the Bhutanese people. There has to be enough room for organizations like Bhutan Post to affordably subscribe to IT services and use it to the benefit of the organizations and the people.

There has certainly been a lot of impact with the establishment of Druknet. However, not all these impacts have been beneficial to Bhutan Post. In fact, there is a slow and negative trend in business since the establishment of the national telecom network.

The long-term sustainability of such initiatives is of great concern. This is particularly true of developing countries including Bhutan. Bhutan Post has carefully considered this concern. It is felt that Bhutan Post would test the advent and benefits of IT genuinely so that such projects do not end up nonfunctional after a few years.

The need for proper logistical support to the tremendous flow of goods around the globe is very immediate. It is already an indication that the proper and efficient planning and establishment of logistical support and supply chain management will create huge business in the future. This is one area that Bhutan Post explores to tape business in. Bhutan Posts is planning to use the Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) service to receive and transmit information about consignments destined to and also those originating from Bhutan. It is already in negotiation with affiliates in Singapore to use a web-based system for this line of supply chain management. With the use of IT in this manner, Bhutan Post expects to improve its business and indirectly provide efficient service to cargo handling from Calcutta Port, which currently takes as much as 13 days. There are however, bottlenecks to the use of such ideas such as the Indo-Bhutan trade agreement on transit of goods and services that requires Indian customs to check goods in Calcutta. Unless appropriate policies on customs are negotiated, it may take a while for this to be implemented.

Bhutan Post's ICT Centre Initiative

The network of post offices that has been established since the early 1960s in the country is a very suitable infrastructure to reach to the rural communities. There are however understandable delays in deliveries due to terrain and locations at times. To start the process of interconnecting post offices, Bhutan Post plans to establish a number of IT centres around the country. During the first phase, 20 IT centres (telecentres) is planned to be established in the 20 Dzongkhag (district) headquarters. The Bhutan Post IT centres will be interlinked through a custom designed web page. All office requirements such as photocopy machines, faxes, telephone, training room, Internet services and office facility will be housed in these IT centres.

The spread of postal system around the country is ideal for interesting ICT initiatives in the rural areas. Bhutan Post does have a plan to make all its post offices including in the rural areas, as IT Centres. These centres would have all logistic facilities. According to the Managing Director of Bhutan Telecom, the concept of Community Telecentre can also be incorporated in these IT centres. Negotiations and discussions are underway with various utility service organizations to integrate their customer service functions with Bhutan Post. For example telephone bills, water bills, electricity bills and Internet bills can be deposited in the post offices. Various government forms and application procedures can be streamlined through the one stop IC centres.

With an intention to move in this direction, Bhutan Post is computerizing it customer service counters. It has also integrated a number of post offices with Internet and telephone public services. It has various businesses including a big fleet of transport buses. The organizations hopes to use this strong transport network for its courier services.

UNDP

Bhutan started acquiring UNDP technical support since 1973. It provides grant technical assistance. It has helped Bhutan on human resource development and other national capacity to achieve sustainable human development (SHD). UNDP, Bhutan focuses on poverty, environmental, ICT and women. In support of these goals, UNDP is frequently asked to assist in promoting sound governance and to support empowering societies. To date, over US $94 million worth of UNDP technical assistance has been provided to Bhutan. The total available budget for the current implementation programme of 5-years is US$ 33 million.

The UNDP supported programmes put emphasis on Good Governance as the primary mean to ensure sustainable human development. Support to the Information and Communications Technologies (ICT) are provided under the theme of good governance. It is believed that at this point in time, the quality of governance is the crucial factor in enabling Bhutan to control its own destiny in a highly complex and competitive global environment. The quality of public sector management in Bhutan is without question the single most important factor in promoting sustainable human development.

UNDP has supported Bhutan since the late 1980s when the Master Plan for the Domestic Telecom Project was prepared. As a result of this Master Plan, Bhutan today has a countrywide digital telecom network. Recent projects in the field of ICT are as follows:

Recent ICT Projects of UNDP

- UNV support to ICT
- Preparation of ICT Development
- Feasibility Study of Internet Cafes
- Capacity Building of Telecom sector
- GIS Institution Building
- Partners in Development
- Capacity of Royal Audits
- Master Plan for Rural Telecom
- Capacity of Roads sector
- Capacity of Legal System
- Strategic Perspective Plan
- Development Management and Decentralization
- Human Resources Development
- Capacity of Aid Coordination
- HRD for Telecommunications
- HRD for SHD sector

UNDP is one of the most agencies that has spearheaded the development process including ICT in Bhutan. Given the shift in their activities towards

governance and Capacity building, it is appropriate to conclude that UNDP will focus and cooperate in this area. A peculiar approach of UNDP is in establishing community telecentres and Internet promotion. It is also focusing more on unemployed youths. Very recently UNDP is in the process of identifying interested unemployed youths and give them ICT training. These trainees will then be involved in web designs and management of various organizations funded by UNDP. The free Internet usage project has also shown that there are huge numbers of people from various walks of life who cannot afford to use computers and Internet. It is these drawbacks that will be considered while UNDP frames its future ICT plans and activities in Bhutan.

UNDP's Internet Promotion Scheme

The UNDP's Internet Promotion Scheme in Thimphu is an ideal example among some ICT initiatives. A total of 3,476 students and teachers participated in the promotion scheme in Thimphu for a period of 2 weeks from 7 March 2001. Five Internet Cafes in Thimphu were involved in providing facilities. It is interesting to record that 37% of the students and teachers came from outside Thimphu for this programme. This indicates a strong need for diversifying such promotion and training schemes in other places in the country. E-mail was predominantly used. It was found that 80% of students who participated already knew how to use a computer and Internet compared to 55% teachers. This shows serious drawback on computer training for teachers. After this finding some Internet Cafes have started providing discounted Internet usage to teachers in Thimphu. Such kind of private participation is very encouraging that sets ideal examples for others agencies and institutions to follow.

DANIDA

The Danish International Development Agency has an office in Bhutan. Their activities were mainly focused in agriculture, health and education. With the establishment of Druknet, DANIDA is spearheading a number of ICT related projects in the country today. Under Danish support, ICT related projects are being implemented in the Department of Revenue and Customs, Royal Institute of Management, DIT, Kuensel Corporation, Cultural affairs, Judiciary and Urban Sector.

Asian Development Bank, ADB

ADB was mainly involved in construction projects in the early years of cooperation. Some of the ADB financed ICT related projects are; Restructuring of Commercial Bank (BNB), Health Care reform, Capacity Building for Construction Development Board, Maintenance Management, Strengthening of Ministry of Finance, Strengthening of the Central Statistical Office, Technical and Vocational Education, and Rural electrification.

Japan International Cooperation Agency, JICA

The biggest achievement in the ICT sector in Bhutan was the establishment of the Domestic Telecom Network. The Government of Japan through the JICA

financed this project. Human resource development in the telecom sector was yet another landmark assistance that trained engineers and technicians on digital technology. There are many other areas such as Forestry, Agriculture, Power and Broadcasting where JICA is engaged.

Table 5 shows the summary of some of the donors in Bhutan. It has been found that there is a growing component on ICT activities in projects that may not be indicating ICT activities directly. For example, the legal framework project of DANIDA for the Judiciary has a major component on computerization of offices. The BACS project of DANIDA also has a major component on networking of regional customs offices.

Donor	Activities
Asian Development Bank	Agriculture, Banking and financial services, Education, Construction, Economic development, Training, Power, Environment, Health,
Australia	Health, Education, Training,
Austria, ACB	Culture, Education, Flood prevention, Forestry, Power, Tourism, Transport policy,
Canada	Education, Agriculture, Information and Communications Technology
Denmark, DANIDA	Agriculture, Environment, Culture, Economic development, Education, Governance
Switzerland, Helvetas	Agriculture, Education, Training, Culture,
JICA	Training, Telecommunications, Flood prevention, Food crop,
WHO	Healthcare, telemedicine

Table 5 - Major donors and their activities

There are a number of ICT master plans that would require donor participation. This would pave ways for donors to engage in ICT related activities in a big way in the future. There are clear indications of change of strategies after the establishment of Druknet. For example, DANIDA finances many ICT related projects today. SNV has a website of their own. World Bank is supporting in capacity building in the ICT sectors. These kinds of change will be more prominent as development agencies and donors restructure their activities to suit the Bhutanese socio-economic environment, which is already showing signs of ICT influences.

CHAPTER 14 TELECENTRE – JAKAR (MCT)

Background

Upon the request of the Government of Bhutan, the International Telecom Union initiated the pilot Multipurpose Community Telecentre in Bhutan as an activity under Programme 9 – Integrated Rural Development of the Buenos Aires Action Plan (BAAP). After feasibility study and field visits, Jakar – a small town in Central Bhutan was selected as an appropriate location for the pilot project.

The objectives of the Multipurpose Community Telecentre at Jakar are;

- Development of modalities to support a sustainable, community based MCTs within the Bhutanese context
- Assessment of the impact of the telecentres on social, economic and cultural development

The objectives were to be realized through clear strategies including;

- Provision of public telephone, fax and e-mail and photocopying services
- Provision of data communication services with file transfer and full internet facilities initially through dialup connection and through dedicated circuit at a later stage
- Provision of telemedicine services with capability of exchanging medical records
- Provision of facilities for education and research - electronic libraries, materials and research papers. Training of educationists and students shall also be part of this programme.
- Provision to trade information and marketing services – access to databases with market information and supplier contacts.
- Provision for local government and community uses for information search and communications
- Provision for capacity building of the MCT staff

The stakeholders of the MCT pilot project were;

- Royal Government of Bhutan
- International Development Research Centre, IDRC
- United Nations Development Programme
- International Telecom Union

Users

- **The Dzongkhag (district) administration -** They would use services for correspondence and information sharing with the central government headquarters in Thimphu and are also expected to provide government and community information to the citizens of Jakar. The

Dzongkhag would also train its people in the use of computer, e-mails, ICT and other associated features.

- **Hospital and health centres** - The Jakar hospital enrolls about 9,000 patients every year. This is the only hospital in the district. There are four Basic Health Units in Jakar district. Besides the use of some basic telemedicine equipment, hospital staff would also be trained in ICT. Access to medical information and online journals would help the health professionals very much in enhancing their knowledge. (Note: the telemedicine equipment that were installed in the Jakar hospital has been moved to the Easter Referral hospital at Mongar)
- **Education -** The schools in the district shall send their students to the telecentre to get free training on Computers and Internet. Besides getting knowledge, this would also create a huge customer base for the telecentre. Teachers and students would benefit from the services given by MCT in terms of online search for updated teaching aids and materials for teachers and in terms of ICT training. This sector could also pilot some distance education system with other institutes within and outside the country.
- **Renewable Natural Resources -** The agriculture and the forestry services of the district could benefit very much from access to ICT facilities. The research centre can exchange research information and data with other centres within the country and outside. Access to information on market prices of agriculture products and imparting these information to the rural communities could greatly help the people. Staff of the research centres and as well of the field offices can be trained on IT.
- **Postal services and Banking -** Possibilities of cooperation between postal and banking services can be explored. With ICT, there will be a successful partnership. Postal department can open one-stop service and ICT centres, whereby people can settle all financial payments in one place. Internet café's can be operated from same locations.
- **Private sector** – Private businesses could be improved with access to latest information on the market. Jakar is famous for fruit products, honey and potatoes. Online negotiations on prices with buyers would bring immense benefits to the producers. Tourism can flourish with the access to tourist markets. Hotels can negotiate and market their services online.

Facilities and Services

There is a LAN, which is connected to the Internet through a 64kbps-dedicated circuit. The telecentre is located near the town and is conveniently accessible to customers. There is a road that reaches the telecentre. The following services are available at the MCT.

▪ Telephone	▪ Fax	▪ E-mail	▪ Internet
▪ Photocopy	▪ Classroom	▪ Filing	▪ Message delivery
▪ Scanning	▪ Editing	▪ Presentation	

The telecom exchange In-charge of Jakar is the MCT Project Coordinator and looks after all administration and operation of the facilities. Bhutan Telecom has appointed a technician to look after the equipment at the telecentre. He is also responsible for basic training courses to the users and students.

Equipment

The following equipments are located in the telecentre.

1 Router	3 Compaq computers	1 Panasonic VCR
1 8-port Hub	1 Photocopy machine	1 Panasonic plain paper fax
2 Modems ADM20	3 APC UPS	1 HP LaserJet Printer
1 SPD 703 converter	1 Sony Television	Cables and Accessories

Implementation

The Jakar telecentre was started in 1998. Due to technical difficulties in the early periods, Internet connection was possible only through dial-up facility. With the establishment of a LAN and a dedicated leased circuit from Druknet, Internet access became convenient and cost effective since early 2000. Bhutan Telecom (then Department of Telecom) mobilized funds from the Royal Government to renovate the old office of the wireless department that was merged with Bhutan Telecom. The rooms were refurbished and made ready for proper installation of computers, modems, routers and hubs. Adequate space was created for office location as well. A vehicle-parking place for visitors was constructed along with an access road to the telecentre.

Service	*Price (Nu)*	*Remark*
E-mail and Internet	3.0 per minute	
Black and White Printing	3.0 per page	
Color Printing	10.0 per page	
Scanning/Editing	10.0 per page	
Computer use	Free	
Telephone/Fax	20% above actual	
Photocopy	3.0 per page	
Consulting	500 per hour	For internet
Consulting	300 per hour	For e-mail
Training	To be fixed	
Conference	To be fixed	

Table 6 - MCT charges

The ITU financed a number of missions to start the telecentre. From initial survey and project documentation to the implementation, ITU consultants were very helpful in establishing this telecentre. Equipments were donated by IDRC, ITU and the telemedicine society of Japan. All these equipment were installed. Bhutan Telecom recruited a technician to look after all these equipments and for other office related works.

Drawbacks

Despite the availability of facilities, the use of Internet and other telecentre facilities did not become very popular as expected. However, business is picking

up as more users and particularly students make use of the facilities more. Jakar is an ideal location for establishment of industries. It is one of the most attractive tourist locations. Therefore, these will contribute to the growth of Internet and computer use.

There are many factors for the dismal performance of the telecentre initially.

- Computer literacy was very low. Most of the people Jakar including teachers, students and government workers did not know how to use a computer
- Interested users like students and youths could not afford to pay the cost of facilities
- Business establishments already had a standard system of working and it was difficult for them to use telecentre facilities for day-to-day work
- Most people used telephone and fax services from offices that were more convenient and most of time free
- Some sector offices already had computers with Internet so the usage was low in the telecentre
- Computer and Internet training was not given to interested people who want to use telecentre facilities
- Fax usage was low due to cost. It was expensive to buy cartridges so the price had to be kept high
- Photocopy machine stationeries like paper and toners ran out of stock fast and took considerable time to replace due to distance

Analysis of Performance

The use of Internet in initial months of April and May 2000 was comparatively higher. This can be attributed to the initial excitement of people to use the new technology and service. But as people experienced the use and particularly the cost of using it, the revenue from Internet usage went down in later part of 2000.

The use of phone and fax went down from the beginning while use of photocopy facility stabilized despite its low performance. In Jakar, photocopy service will pick up slowly as new projects and activities come up in future. The small revenue from this service cannot be attributed to underutilization. It is due to the small number of organizations and individuals who need to use computers and carry out documentations. Printing will continue to generate low revenue as long as the major users, students are taught how to download research and reading materials. Internet and photocopy services will be highly utilized. Cost may be one important factor that will determine usage in future. A ream of printing or photocopy paper cost Nu 150. It has 500 paper sheets and at the minimum rate of Nu 3.00 per page, it adds up to a minimum of Nu 1,500 in revenue. This is a very high margin. Bhutan Telecom will have to reduce the charges drastically to encourage people to use more.

Month	Internet	Photocopy	Printing	Phone/Fax
Mar-00	200	300	0	1,071
Apr-00	840	321	15	586
May-00	3,340	1,182	24	285
Jun-00	400	147	12	331
Jul-00	350	1,029	0	792
Aug-00	0	491	0	930
Sep-00	0	6	0	60
Oct-00	0	42	0	0
Nov-00	296	101	0	54
Dec-00	0	84	0	588
Jan-01	0	77	0	38
Feb-01	75	9	0	50
Mar-01	0	229	220	60
Apr-01	726	229	0	60
May-01	404	90	0	80
Jun-01	75	1,317	0	204
Jul-01	189	71	0	136
Total	**6,895**	**5,725**	**271**	**5,325**

Table 7- MCT Revenue by category

Revenue from Internet will grow. The use of printing facility will also increase. Computer illiteracy is an important factor to the low usage at present.

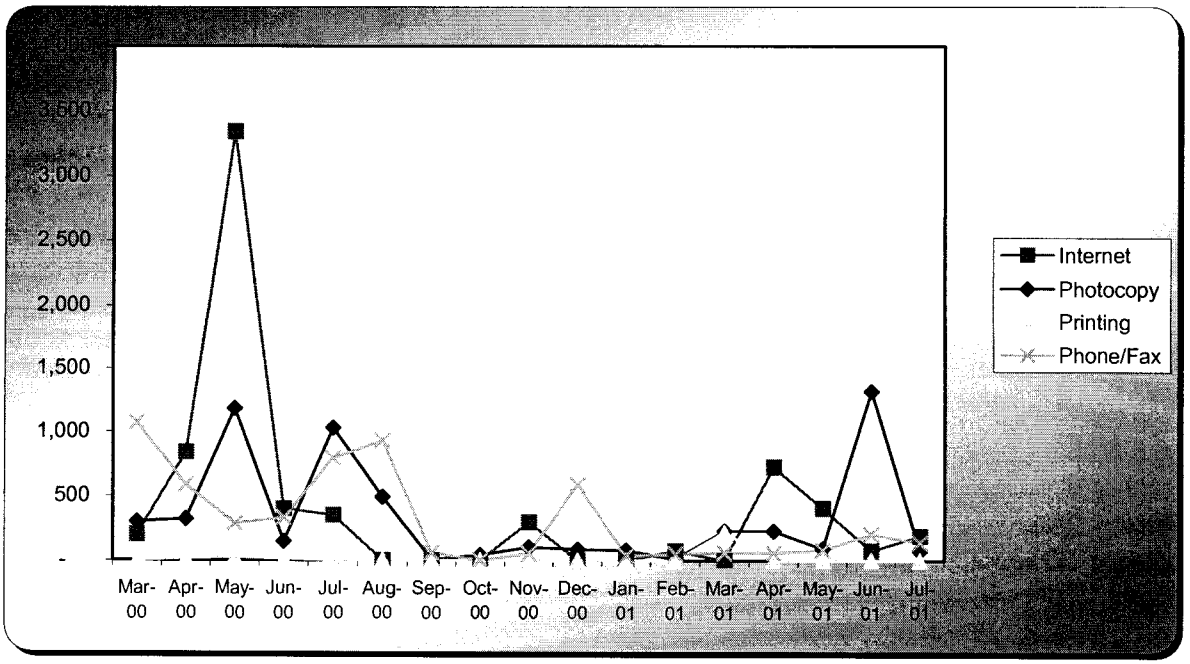


Figure 20 - Usage of MCT facilities

Internet Training and Promotion Scheme

Bhutan Telecom is carrying out a 6-month long free training and Internet usage promotion at the Multipurpose Community Telecentre in Jakar from June in cooperation with the UNDP. This is the second Internet Promotion Scheme funded by UNDP. The first scheme was carried out in Thimphu through various private computer training institutes and Internet Cafes. In Jakar, the free training program on computer applications and Internet was provided to 278 trainees from different fields and walks of life and the free Internet usage scheme was carried out in August 2001. An independent survey was carried out on the free Internet usage scheme. A set of questionnaires were developed in a format and Internet users were asked to fill the form every time they visited the telecentre to use computer or Internet.

There was a huge demand from users for this scheme. The telecentre was opened from 9 in the morning till 6 in the evening. This was later extended by 2 hours till 8 pm to accommodate more people. As there are only 3 computers in the telecentre, many of the user demands were not fulfilled.

Free Internet promotion survey analysis

There are many factors that contribute to the efficient and productive use of computers and Internet. The Bhutanese society has its own unique features ranging from its culture, tradition and environment to people's habit, behavior and lifestyle. It is perhaps this uniqueness that influences the behavior of Bhutanese towards new technologies and gadgets.

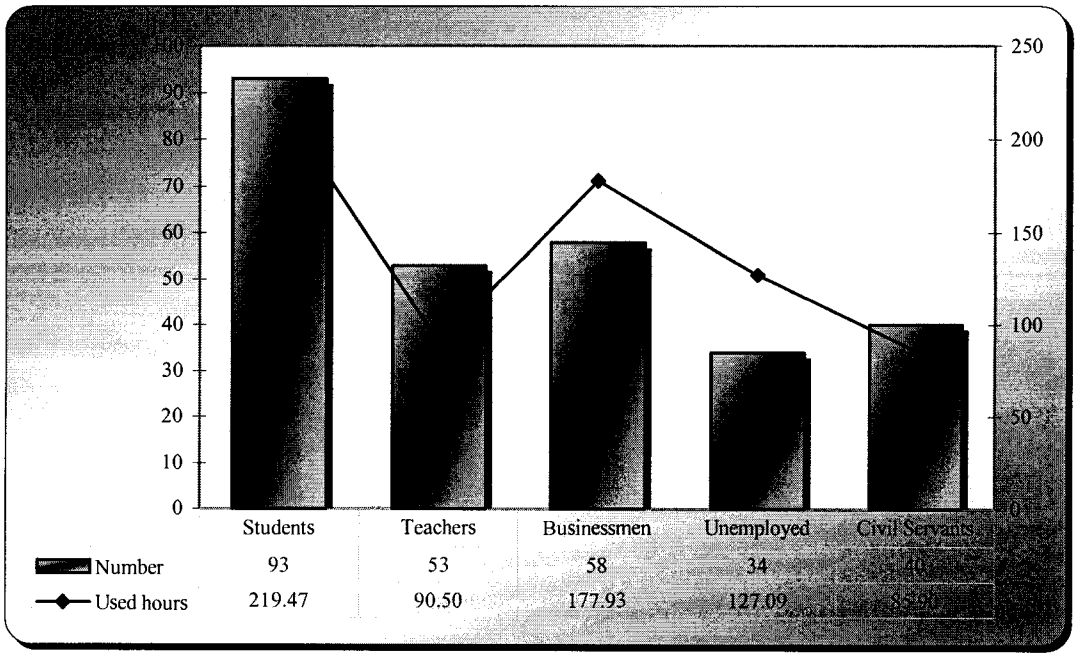


Figure 21 - Category-wise number and usage details

93 students used a total of 219.47 hours of Internet time in one month, an average of 2.36 hours per student. Though there were only 58 businessmen who used Internet, each of them used an average of 3.07 hours of Internet time.

	Number	Total hours
Students	93	219.47
Teachers	53	90.50
Businessmen	58	177.93
Unemployed	34	127.09
Civil Servants	40	85.90
	278	**700.89**

Unemployed youths used a bit more than businessmen at an average of 3.74 hours per person. There are various factors to this. Businessmen and unemployed youths have more free time than students and civil servants. While students would use more given more time, the large number who desired to use could not do so due to the inadequate number of computers and time available.

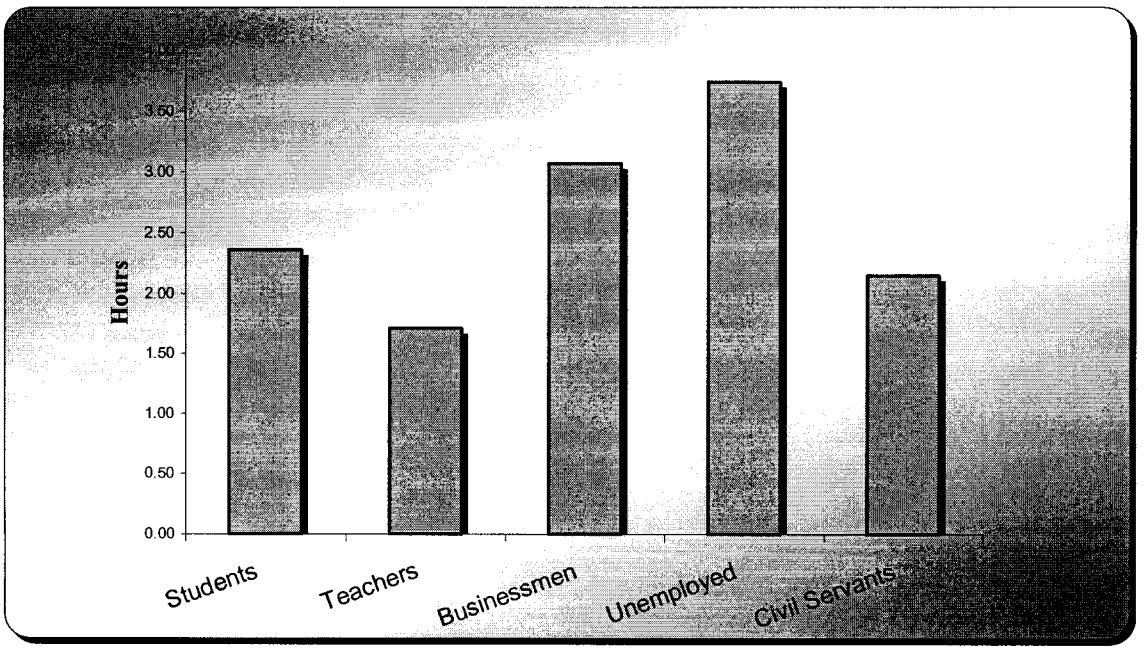


Figure 22 - Category-wise usage for August

Conclusion

The success of the Jakar telecentre is cited as an ideal example of ICT access strategy to the Bhutanese community. In a country like Bhutan, community telecentre would bring tremendous benefits to the sparsely populated places. Moreover, such integrated service facility would be cost effective. Government officials, sectors heads, businessmen, students and unemployed youth in Jakar agree that the telecentre has brought lot of new things to the district. Many people use the facilities available and there is every sign of a healthy growth. The free training provided will also supplement this.

The promotion scheme showed that possible users would need training and guidance initially. Bhutan Telecom, in cooperation with development partners and agencies, plans to promote Internet aggressively around the country. Trashigang in eastern Bhutan has been identified as an ideal location for the next initiative. Based on the success of Jakar telecentre and the interest it has generated in people, the UNDP has made a project proposal on establishing 20 more telecentres in the 6 eastern districts. While Bhutan Telecom has strong reservations about this proposal due to inadequate telecom infrastructures in as many places, this project does look promising for promotion of ICT in the country. The UNDP is also initiating and mobilizing funds for the establishment of education Research Resource Centres around the country. This is in line with the IT Master Plan for Education, Package 5.

The collective and integrated use of ICT facilities is important in Bhutan. Even in district headquarters, population concentration is very low. The low levels of development activities do not demand use of Internet and computers very much. ICT resources particularly Internet could possibly be underutilized. Small networks linking offices of the administrator, agriculture officer, animal husbandry officer, education officer, health officer and a public café in a central location and sharing Druknet Internet package like Internet Lite would be an appropriate solution. For now, rather than injecting huge resources to the ICT sector without any specific direction, coordination and framing a national ICT action plan to make ICT use effective, efficient and cheap to the community users, is the need of the hour.

CHAPTER 15 CONSTRAINTS

Constraints in Overall Development

Right from the inception of its first development plan in 1961, it has been recognized that due to the location and size of the country, its economy will be export driven that will rely heavily on markets in neighboring countries. Having abandoned a strategy of self-imposed isolation, Bhutan has looked to increased economic interaction with other countries as an avenue for development. The development of Bhutanese economy is, however, constrained by several factors:

- Bhutan, as a landlocked country, is geographically isolated from other countries and is 800 Kms from the nearest seaport in India. This substantially increases the costs of transport of goods into and from Bhutan.

- Land for agricultural production is limited. This restricts the potential for increasing output from the agricultural sector.

- Bhutan has scattered population and people cannot take advantage of the limited land suitable for agricultural production in a cost effective manner.

- Because of terrain and the distribution of population, construction of roads and communication networks is expensive and difficult.

- Bhutan has a relatively small population and the supply of trained manpower is a major constraint. The fairly recent introduction of modern education has not been able to make good the shortage of manpower with the necessary skills.

- The use of currency in community trades is still limited. This has restricted the Government's ability to raise domestic revenues, and Bhutan has relied on external assistance for the funding of development programmes.

Constraints in ICT development

There are a number of factors that limit or constraint the development of ICT in Bhutan. In the process to computerization of schools, health centres, administrative centres, sector offices and the community at large these factors will have to be taken note of. The history of ICT development in the country is very recent. The first telephone lines were laid only in the mid-1960s. The government of India laid the first telephone trunk lines. The Royal Government took over the full administrative control of the then Telephone Department from the early 1980s. Soon the under the financial and technical assistance of UNDP and the ITU, a Telecom Master Plan was ready. The implementation of this

Master Plan started in 1992 under the Grant Aid Assistance programme of the Government of Japan.

The following are the constraints and drawbacks in the development of ICT experienced since the start of the telecom project in various sectors.

Telecom Sector

During Project Implementation

- Engineers and technicians were very few
- There was complete inexperience in installing digital telecom systems
- Transportation of heavy equipment into the country was difficult and time consuming (they had to be brought from Calcutta port by road)
- Maintenance centre was not available for heavy equipment
- Constant road blocks due to snow and landslides hampered smooth work routine
- Project implementation plans were too rigid and not much flexible to changing demand pattern

Lessons learnt

- There was need to train enough engineers and technicians
- It was necessary to engage Engineers and technicians for on-the-job attachments during project implementation
- There is need for reliable courier and transport agencies
- Maintenance service centres need to be established to reduce maintenance costs
- A reliable logistical support was felt necessary due to isolation and distance of some of the locations
- Professional method of working similar to that of Japanese engineers was felt necessary.

Constraints to Future Activities

- Network bandwidth constraint (only one 64 kbps leased line feasible in all 20 district headquarters)
- Demand for dedicated leased circuit cannot be met immediately
- Engineers and technicians not adequate in areas and locations away from Thimphu
- Telecom backbone network already 10 years old and may need replacement or major maintenance from now on.
- Availability of spare parts very difficult
- No Master Plan for Rural Telecommunications
- Corporatization of telecom sector makes it difficult for coordination with government agencies
- Telecom, as a corporation, may be guided by a desire to make profit

Druknet

During Implementation

- Number of engineers and technicians were very small
- Equipment transportation was cumbersome and time consuming
- Training to engineers were short and inadequate
- The time duration for implementation was too short

Lessons learnt

- The need to train enough engineers before the start of project implementation was felt necessary
- Logistical coordination for timely delivery of project equipment is important
- There should be enough preparation and implementation time for projects
- Appropriate national capacity has to be developed in the ICT field

Constraints to Future Activities

- Number of Druknet engineers and technicians small and may not be able to cope with the increase in Internet subscribers
- International data bandwidth is constrained due to unforeseen increase in the number of users
- Space for Druknet establishment is not adequate and will need to expand or shifted in future
- Frequent upgrades of softwares and hardware not timely as engineers and technicians are not trained in new softwares and hardware
- Druknet does not have a single engineer trained in Cisco systems that are used
- Druknet does not have a software engineer or any web designers. It also does not have a professional webmaster
- There is no professional filing and information storage system

Education Sector

- Student computer literacy is extremely low
- Computer knowledge of teachers and officers is limited
- Inadequate budget to purchase computers and accessories
- The IT Master Plan for Education does not address communication and maintenance costs and may need to be reviewed
- Education headquarter offices are scattered that hampers effective use of available network and computers resources
- There are no standard software and applications
- There are only 7 ICT engineers and technicians
- There are no computer courses in schools
- Except RIM, Sherubtse College and a few high schools, there are no computers in schools and institutions
- The number of computers in the whole education sector including schools is 211 of which only 166 are Pentiums.
- Only 3 of the 11 divisions and schools surveyed have networks.
- There are no computers in Junior high schools and primary schools

- Most of the schools are in remote locations

Health Sector

- Computer knowledge of headquarters staff inadequate
- Number of computer engineers and technicians very small
- Health workers including doctors have very little or no knowledge of computers and Internet
- The only Health institute in Thimphu has no computer courses
- ICT and health activities are not synchronized and coordinated
- Coordination of information flow not efficient and synchronized even in Thimphu referral hospital
- There is absence of specific data storage and health data mining strategy
- There is inadequate budget
- Telemedicine plan is too ambitious

Agriculture (RNR) Sector

- Field and extension staffs have no computer and Internet knowledge
- There are no computers and networks in most of the field offices
- The number of computer engineers and technicians is not adequate
- Not enough resources to carry out major ICT activities
- Many district officers are hesitant to use computers due to lack of knowledge and experience
- No specific and standard application developed for RNR use
- Due to high cost of Druknet charges, many offices are hesitant to use Internet

Communities

- People do not know English
- Most people have not even seen a computer
- Primary and community schools do not have computers
- In most villages in Bhutan, there are no telephones and electricity
- Transportation, installation, maintenance and training costs will be very high
- It will be difficult to identify an agency to coordinate community ICT projects

Private Sector

- Very small private sector
- The number of Enterprises that can afford computers, networks and Internet is extremely low
- Computer professionals generally start their own businesses
- Government incentives like tax relaxation were introduced too late to boost ICT development
- Many individuals and small companies still cannot afford to buy own personal computers
- Most of the companies in Bhutan are family owned business and it will be difficult to influence any major policies. The proprietor generally manages Internet accounts for personal use.

- Full ICT investments is expensive so companies normally buy standalone computers for some basic office works

Conclusion

The general ICT awareness is rising, but there is a lack of ICT professionals and qualified human resources in all sectors and institutions. Since 1980, 170 students have been trained at Royal Institute of Management (RIM) in computer related subjects and more 350 people received training in specific ICT systems abroad. Only one third of these hold positions relevant to their field of expertise. Due to the poor status of ICT infrastructures in their offices, there have not been any appropriate opportunities in public sector. Many experienced professionals have left their jobs and started their own businesses. This has created a vacuum for trained ICT professionals in the government sector.

Information systems are being established in different ministries in an ad-hoc manner, resulting in a redundancy of information and resources. No study has been on the overall information system of the country. Donors active in ICT projects in Bhutan also do not have any specific ICT framework of engagement. There is a need to overcome the various obstacles and to create local capacities before affordable and sustainable ICT services can be offered to the population as a development tool. There is also a need to use appropriate technology, not too advanced but not too simple as well.

CHAPTER 16 SECTOR SURVEY ANALYSIS

Background

No survey was ever carried out on the various ICT issues with district sector officers. These offices will play crucial roles in the development of ICT in the future.

Fifteen questions were developed covering various aspects of Sectoral issues in the districts. Annexure A shows the sector survey questionnaire. The following 10 districts were selected for the survey

1.	Wangdue Phodrang	2.	Samdrup Jongkhar	3.	Gasa
4.	Tsirang	5.	Trongsa	6.	Chukka
7.	Mongar	8.	Paro	9.	Pemagatshel
10.	Haa				

And the following sectors were covered in the survey.

1.	Agriculture	2.	Health	3.	Education
4.	Irrigation	5.	Animal Husbandry	6.	Finance
7.	Administration	8.	Roads	9.	District Court

A total of 81 sector heads responded to the questionnaire.

Analysis of Answers and Feedback

1	Do you think Internet has benefited the working and productivity in your line of work or in your sector in the District?	Yes - very much	35
		Yes - to some extend	22
		No	6

Many sector heads having access to Internet say that it has benefited their working. There are many officers who have some knowledge of Internet or who have used computers and Internet. However, as they do not have Internet access, they share this service with other colleagues. These officers tend to feel that Internet has benefited their working to some extend. There is great potential for efficient utilization of Internet if this service is available to them. Where there is no Internet access or computers, people have responded that Internet has not benefited their working. This group of officers will need training as well as computers and Internet access.

2	What type of information & Communication technology (ICT) services do you use?	Telephone only	12
		Computer only	8
		Tel with Computer without Internet	40
		Tel with Computer with Internet	21

69 of the 81 sector heads say they use computer directly or indirectly. In many sector offices, the only form of ICT facility available is a telephone. Many sector

offices are having computers as well. Survey indicates that sector officials use telephone and computers without Internet access and there is a small number of sector offices that have access to Internet. Though there are quite a large number of computers in sector offices, there is still poor penetration of Internet. This is because many district administrations still do not consider Internet a priority. The few offices that have Internet availed such services through specific projects.

3	Pertaining to the above question, what type of ownership do you have?	Have my own telephone in office	32
		Have my own computer in office	31
		I share telephone with others	28
		I share computer with others	32
		I use whenever and wherever available	10

There are well-balanced answers to this question. This indicates that while many sector offices have telephones and computers of their own, as many number share these services with others. Therefore, basic services like telephones and computers are priorities for many sector offices. Efficiency will be enhanced and these services would also increase their morale.

4	Do you know how to use computer?	Yes - a little bit	50
		Yes - I am proficient	21
		No - I don't know anything	3

Most of the sector heads know how to use computers. They are either using computers in their offices or have used one before. A large number are proficient in their use. Officers who know a little bit of computing can be trained further. Desktop editing, worksheet maintenance and database applications can be taught to make them proficient. Standard system of filing and data management can also be taught.

5	If you do not have telephone or computer in your office, what could be the reason?	Not enough budget	26
		No stable power supply	4
		Not required in my office	
		Don't have coz' I do not know usage	

About 30 sector officers still do not have their own telephone or a computer due to inadequate budget. This indicates that many offices could not buy a computer or avail telephone connection due to lack of fund. Many sector heads say that computers in their offices were bought through some project funds. Stable power supply is also a reason for the unavailability of computers in particular.

6	If there is a computer in your office, how was it bought?	Bought through government budget	46
		Bought through project	25
		I use my own computer	1

Analyzing question 5 and then question 6, it appears that government has provided funds to buy computers to a select group of sector heads. There are a small number of district headquarters that do not have stable electricity. All district headquarters have telephone service. Therefore, as these facilities become efficient and budget available, more computers will be provided to sector heads.

7	Normally with whom do you talk from official telephone if you have one?	With HQ officers	72
		With colleagues in my district	46
		With colleagues in other districts	34
		With people outside Bhutan	2

Though sector offices report to the district administrator, many of their offices are located outside the office of the district administrator. 72 sectors heads surveyed said that they talk with headquarter officers over their telephones. A substantial number among them discuss with their colleagues in the district whose offices are located at a separate location. Many talk with colleagues in other districts. Therefore, it can be concluded that telephone, in particular, has helped the sector heads tremendously in their day-to-day work.

8	When you make official calls, what types of topics do you normally discuss over telephone?	Plans and policy matters	45
		Budget and Adm. Matters	50
		Current work matters	49
		For advice and help	39

Sector heads normally discuss and cover all aspects of Sectoral works such as discussions on plans, policies, budget, works matters and advice. Preliminary Sectoral budget discussions are held during the months of March and April. Officers discuss such budget issues with planning sectors of their respective headquarters. Field officer and research officers contact headquarters and research centres for work related matters and technical advice.

9	If you use a computer, what do you use it for?	To type letters	57
		To keep official record	68
		To use internet	20
		To learn computing	10
		This question is not applicable	1

Among those who have computers in their offices or who use computers indirectly use them to store office records. Many of them use computers to type letters. A substantial number use computers to surf Internet and learn computing.

Looking at the response, many district sector officers use computers productively. Provision of suitable database softwares for record keeping will be useful. This would also help develop a nation-wide government Intranet for similar works.

10	Do you use computer to search for information from Internet?	Yes	44
		No	13
		This question is not applicable	24

Many officers who use computers and the Internet use them to search for work related information from the web. It is found that 10 officers who do not have computers and Internet connection in their own offices, use others' computers to do this work. Many sector heads are interested to use the Internet.

11	If **'yes'** to above what types of information do you read or download?	My work related research information	18
		News on subject of my work	13
		News and current affairs	13

Most of the people who use Internet from offices use them for work related information and to download important research information from the web. As is common in most offices and due to unavailability of cable TV services, Internet is also used to access worldwide news and current affairs.

12	If you don't have, at what price do you think you can afford to buy a personal computer?	Below Nu. 10,000	10
		Below Nu. 20,000	9
		Below Nu. 30,000	19
		Price no bar if computer is of good brand	21

Many officers feel that they can afford to pay around Nu 30,000 to buy a computer. Even upon information that it is difficult to find computers below Nu 20,000 or Nu 10,000, many people intend to buy computers at these prices. This indicates that officers are interested to buy computers but may not be able to afford them.

13	If you have computer/Internet in your office, do you think such facility should be extended to the field offices of your sector within the District as well?	Yes	66
		No	6

District Sectoral officers are assisted by a number of field and extension officers who are spread around the district. Many of these field offices now have telephone service and electricity. Provision of computers is virtually nil. District sector heads feel that computer, telephone and Internet services will be useful and should be extended to these field offices as well.

14	Do you think it will be beneficial to use Internet and computers in the district where you work?	Yes - I completely agree	65
		Yes - Will be beneficial to some extend	13
		Yes - It will be beneficial but is too early	3
		No - They will not benefit	

Most of the sector heads completely agree that Internet and computers will benefit the district administration. Some officers are naïve with this view. They still feel that it will benefit only to some extend. Given the strong agreement on this issue, it is necessary that sector offices will have to be provided with computer with access to Internet.

15	If computers with local language texts like Dzongkha with training are provided, do you think people will use the computers in villages in your Dzongkhag?	Yes	57
		No	24

Sector officers have to work very closely with village and community leaders. They represent their sectors in the 'Geog Yargay Tshogchung' (village development committee) and 'Dzongkhag Yargay Tshogchung' (district development committee). They know best the requirement of the community. Though most of the sector heads agree that computers with local language applications will encourage local people to use computer and the Internet, many still feel it will not. Literacy rate even in local languages is still low even. Rural economy is still poor and many people do not need to use a computer in any manner.

Background

It is now more than 2 years after the establishment of Druknet. During this period, no study has been made of any kind pertaining to customer behaviors and feedbacks. For example, there is a strong feeling that Druknet charges are exorbitantly higher than many other ISPs in the region. This may be true but officials in Bhutan Telecom have their own side of the stories. Many customers and observers alike complain of slow connectivity and sometimes complete loss of mails. Various virus and hacking alerts have also kept engineers at their toes. The survey was therefore very important not only for the study but as a feedback to the management as well.

A total of 200 customers were selected for the customer surveyed out of whom 102 replied. There are many reasons for this low response. First, customers were selected at random. Many users are from government offices where there is no specific person to respond to such questionnaires. Many people responded saying that they cannot afford to pay the connection charge during the time of answering. It can be concluded that many people use e-mail much less than the actual surfing.

The following section will discussion question by question, the feedbacks and answers received from users.

General Account Responses

1. Do you own a computer?
   73% of people said they own a computer and 27% say they do not have computers of their own. Many people who subscribe to Internet and e-mail from Druknet do own personal computers. Public servants and officers subscribe to Internet through government offices. It also shows that private individuals respond to questionnaires of such kind more than people who do not own computers of their own. Most of the government accounts are also registered from their local organization web server.

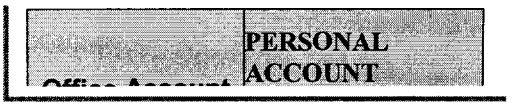
2. When did you subscribe to Druknet?
   70% of the people surveyed said that they have been Druknet subscribers for more than 1 year. This does coincide with the fact that there were more private customers during the first year of establishment.

3. What type of telephone connection do you use to connect to Druknet?
   55 respondents said they have separate lines for Internet connection and 47 use their phone lines to connect to the Internet.

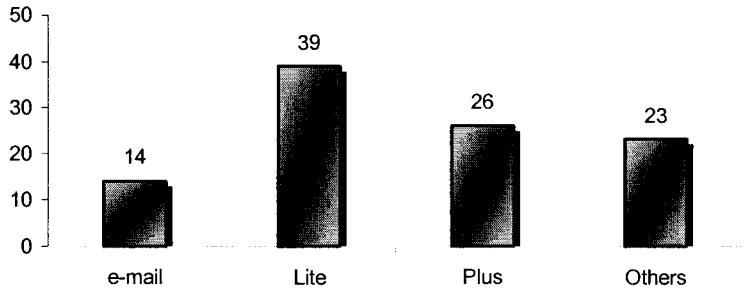
Separate Line	Phone Line
53	47

This also goes along with the fact that private subscribers who can afford to own computers of their own and a personal Internet connection, would also afford separate lines for Internet.

4. Do you use office or your own personal Druknet account?
59% of respondents have personal accounts and they would constitute most of the private individuals while 41% use office account. This suggests that many people do have access to computers from their homes without personal Internet account.



5. Which package of Druknet do you or your office use?



Out of the 102 respondents, 14 used e-mail, 39 used Internet Lite, 26 used Internet Plus and 23 used other packages. Druknet officials also agree that the majority of customers are for the Internet Lite package. This suggests that Druknet users do not use Internet overwhelmingly. Internet Lite has 15 hours of free Internet access and an e-mail account

Package	E-mail	Free hours	Setup fee	Monthly fee	Extra per minute
Internet Lite	1	15	500/-	1,000/-	1.5/-
Internet Plus	1	30	1,000/-	1,800/-	1.5/-

at a monthly fee of Nu 1,000 and a one-time setup cost of Nu 500. There are appreciable number of users who are subscribed to Internet Plus as well. These users would normally constitute the private companies and some government offices. It was found that many offices subscribed to Internet Plus have small LANs in their offices.

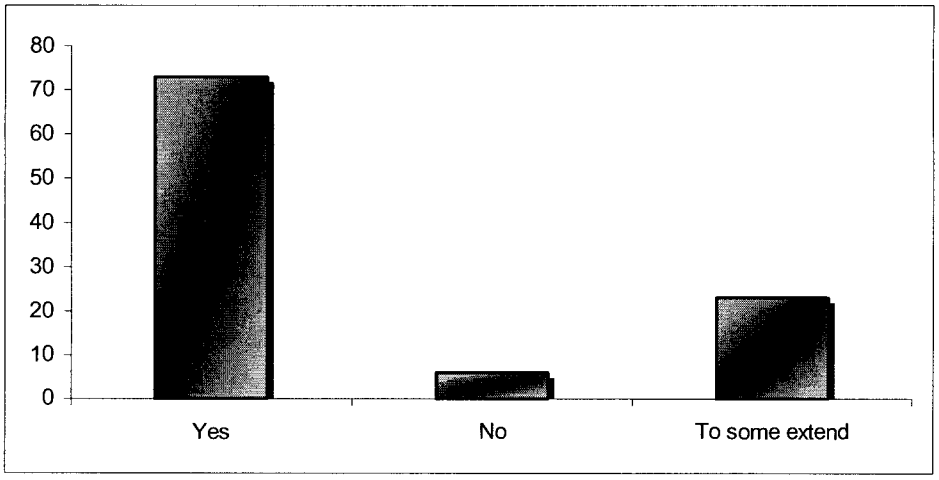
6. What is the average duration of your Internet usage?
There is uniformity on the usage hours. 26 said people said they use less than 5 hours, 25 said they used from 5 to 10 hours every month, 23 said they use 10 to 15 hours and 28 say they use above 15 hours of Internet time.

7. Why do you use Internet most of the time?
Survey shows that most of the people used Internet for e-mail and an almost use for news and to get access to information. Only 28 people say that they use Internet for business. Many use Internet for a combination of services like news, e-mail and download.

8. What do you think of the Druknet charges?
87 people said that Druknet charges are expensive. There were only 15 people who said that the charges are affordable. This constituted project and government accounts. All users with private accounts feel that Druknet charges are exorbitantly high.

Feedbacks on Development issues

9. Do you think establishment of Druknet has served its purpose of information technology for the overall development of the country?



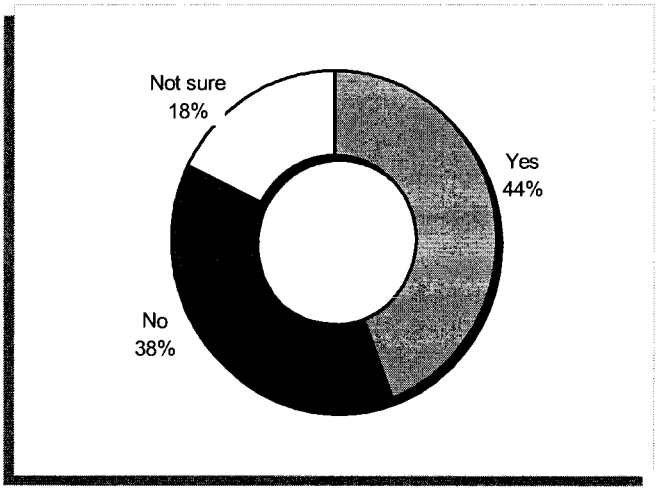
Most of the respondents feel that the establishment of Druknet has served the purpose of information technology for the overall development of the country. Only a small number feel that Druknet has been able to do only to some extend and an insignificant number feel that there has not been any impact.

10. The stakeholders in the establishment of Druknet were RGoB, IDRC and UNDP. Do you think, donors should continue financial support in the field of IT development in future?
The developments in various sectors in Bhutan and particularly in the field of infrastructure development like road construction; telecommunications and power have been achieved through various donor cooperation and assistance. The

Yes	No
84	18

establishment of an Internet Service Provider, ISP was a slow decision of the government pertaining to Internet policy. Most people still feel that donors such as IDRC and development partners such as UNDP should continue supporting Bhutan in the ICT sector.

11. Do you think Bhutan Telecom/Druknet is making enough effort to reach IT to all categories of the Bhutanese population?



It is interesting to see that only 44% of respondents feel that Bhutan Telecom/Druknet is making enough efforts to reach ICT to the Bhutanese population. 38% feel that it is not doing enough as it should. One of the important mandates of Bhutan Telecom is universal service. This includes all types of ICT services including Internet. Therefore, if such a high percentage of people are saying that it is not doing much, then Bhutan Telecom/Druknet will have to review its strategy. One of the reasons for this response is the high cost of Internet and telephone charges. People feel that if Bhutan Telecom had good intensions to promote ICT to all areas, then its charges speaks for itself.

12. Have you personally benefited from Internet services in Bhutan? If so, please indicate in what ways you have benefited?
Many people surveyed said that Internet has brought about immense benefits to people on a personal level. About 67 people said that Internet helped them to get lots of valuable information. An equal number say that after the introduction of Internet, communications costs have been reduced. Other benefits such as enhancing business and increasing contacts where also cited.

13. Kindly explain how effective has Internet been in your line of work or business?

Very effective	48
Effective	52
Not very effective	2
Not Effective	1

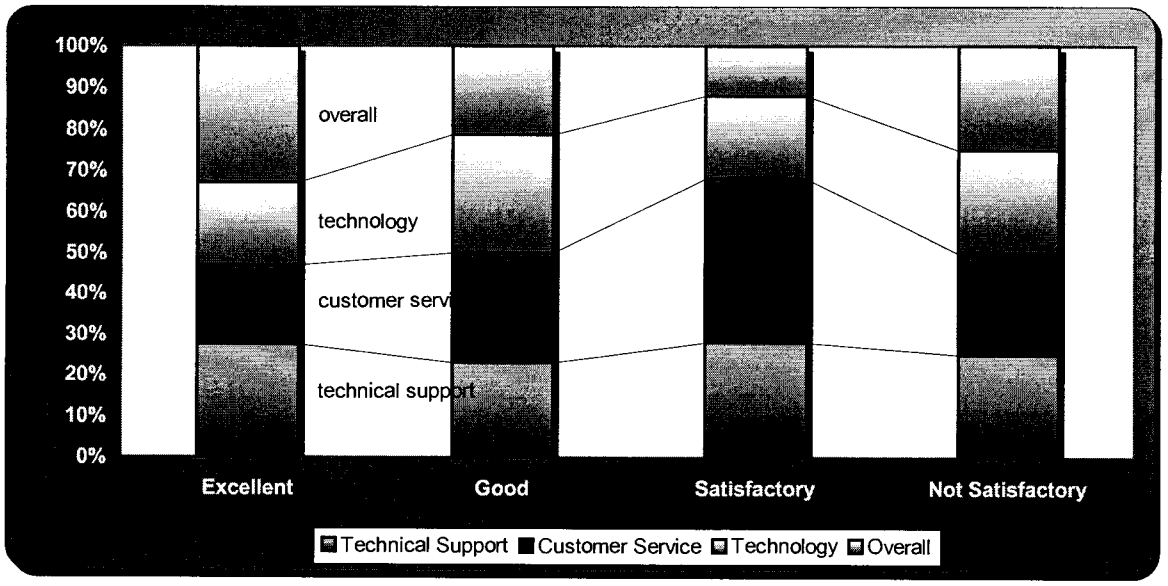
Generally people say that Internet has been either effective in their line or work or business. The Director General of the Department of Trade agrees that telecommunications and Internet has changed the way people do business or work in Bhutan. Communication

and logistical costs in particular are reduced and businessmen have been able to explore markets more efficiently.

14. Besides efficiency and speed in what other ways have you benefited from Internet services by Druknet?
People feel that they have moved along with the developments around the world. Many also feel that they have been enlightened and able to gain knowledge. They have become more smart and competitive.

15. If there is another ISP with the same charge for Internet, will you change your ISP or continue subscription with Druknet?
Responses to this question were interesting. While most of the respondents say that Druknet charges are expensive, they also say that they would continue with Druknet subscription. This may be because of the reliable service that they have been acquiring despite occasional disruptions.

16. (a) In terms of Technical Support, how do you rate Druknet services?
(b) In terms of Customer Service and Assistance, how do you rate Druknet services?
(c) In terms of Connection Speed and Efficiency, how do you rate Druknet services?
(d) In terms of Overall Performance, how do you rate Druknet services?



The figure above shows the responses of users to the various services of Druknet. Some issues of concern are Druknet's performance by technology. The satisfactory response is due to the frequent service disruption. Customer service is only scored as satisfactory. Druknet will

thus have to strengthen its customer services. Overall rating of Druknet is Excellent.

17. Do you think the reach of Internet to rural areas needs to be improved further?
While 48 people say that Internet access to rural areas need to be improved, 54 responded otherwise. As most of the users reside in urban areas particularly in Thimphu, this response was imminent. Penetration of Internet to rural areas is negligible.

18. Do you think more Bhutanese people or more of your friends will use Internet in the future? If yes, why?
57 % of users feel that the Bhutanese people will not use Internet for quite sometime. Given the low computer literacy and the absence of any big ICT promotion scheme at the community level, this may be justified. As telephone services and computers reach the community, the usage of Internet will be immense. Unless there are genuine and concerted efforts from all parties with full resources, this will remain a dismal goal for sometime.

19. Which sector do you think Druknet should concentrate more?
Most people say schools and district headquarters should be the priority targets for ICT development. This would create markets and improve governance. Many people feel that ICT should be reached upto the 'geog' level. This is the target of the 9th Five Year Plan. However, unless agencies and sectors work together by pooling in resources and know-how, this may not be achieved in the most cost effective and affordable manner.

20. In your view, do you think the framework of the 9th Five Year Plan should substantially incorporate IT, given the successful introduction and use of IT/Internet in the 8th Plan?
96% of the users feel that ICT should be a high priority sector for the 9th Five Year Plan. This would ensure continuity in the ICT development sector from the previous plan period. Preparatory documents of the 9th Plan do indicate ICT as a major component to boost socio-economic development in the country.

Conclusion

Druknet has served many purposes. It enlightened people on the vast resources available on the Internet.

People started using e-mails and it saved costs. People say Bhutan is now closer to the world and friends are relatives are just a click away. Some people recommend Druknet to reduce charges so that more people and students will be encouraged and more importantly afford the use of Internet. There are also

recommendations that Druknet should provide free e-mail addresses to all people who are interested.

Most of the respondents feel that Bhutan should continue exploring donor assistance to improve its ICT facilities and services.

The lack of customer service in Bhutan Telecom vis-à-vis Druknet is very much needed. Some even point out the lack of coordination between the telecom and the Druknet sectors.

Many people have reservations about reaching computers and Internet to rural areas. It is felt that these services will be expensive to establish and will be underutilized.

Regarding activities for the 9th Plan, some people say that Government has to develop a log frame for each activity.

CHAPTER 18 POLICY IMPLICATIONS

The successful implementation of Druknet project is recognized as the landmark achievement in the history of modern Bhutan. It is also recognized that such significant projects can be implemented within a very short time when appropriate decisions are taken on time supplemented by adequate resources. The Royal Government will need to take a number of bold decisions for ICT to achieve its intended objectives in the country.

Education

In the education sector, resources will have to be mobilized immediately. Technology become redundant very fast and this fact need serious consideration while framing implementation plans. Heavy investments will need to be made on resources and training on computer and Internet. Adequate rules and regulations will have to be developed to safeguard students from getting access to inappropriate information.

Bhutan Telecom and Druknet

The domestic telecom network will have to be expanded. There is already serious concern about the availability of adequate bandwidth for future ICT projects from various Ministries and Agencies. Bhutan Telecom is a Corporation and it may be guided by its desire to fulfill shareholders [fully owned by the Government now] desires for profit.

Druknet will need constant upgrades. It is owned by Bhutan Telecom and is the sole ISP in Bhutan. Government might introduce competition in Internet services in future. In doing so, the users will be the ultimate beneficiaries.

District Administrations

Capacities in terms of resources, infrastructures and human resources will have to be enhanced in the districts offices. As most of the sector offices are located in one place and under one administration, sharing of available resources and facilities will make use of computers and ICT services cost effective and optimum.

Health and Telemedicine

Telemedicine is a very useful tool. But its implementation will need serious study from costs, sustainability and maintenance point of view. Rather than covering all hospitals, government might introduce telemedicine in only select hospitals. Use of health information will be regulated to protect personal data being misused.

Community Telecentres

Government will encourage Multipurpose Community Telecentres in the country. The choice of technology is already underway for rural communications. IP

based telecom systems will probably be and rightly so, the predominant technology for rural access.

Renewable Natural Resources

Huge investment will also be required for the Enterprise Network of the Ministry of Agriculture. This web based application system will be cost effective, given the high cost of leased line circuits. It is important for the government to encourage integrated and similar systems in other Ministries as well.

Private Sector

Government will need to invest substantially to encourage the private sector as a whole. Telecommunications and Internet services are used by the private sector for cost reduction and productivity. When enough resources are available, there will be more support and initiatives so that ICT can be used not only to increase profitability but also to generate employment. Government might be reluctant to invest in the private ICT initiatives due to lack of enough study and benchmarks and above due to lack of financial resources.

Rules governing ICT

The impact of the free access to unregulated information to the Bhutanese people will be closely observed. Decentralization and restructuring of the governance has empowered the Bhutanese people more. Therefore, government may frame strong and appropriate policies on ICT so that available information and resources are used in a very positive manner that directly or indirectly contributes to the overall socio-economic development of the country.

Employment

Entrepreneurship will be encouraged at all levels. However, these initiatives lack adequate resources. The issue of unemployment will influence many of the government's policies in the future. In that respect, ICT will be greatly explored to provide more vocational qualifications and skills development that would engage unemployed people productively. Rural ICT programmes will be encouraged to discourage rural-urban migration.

Multimedia Act (ICT Act)

There is a lack of clear ICT policy direction in the country. Organizations have ICT plans that are not based on any specific strategy. There is an immediate need for a Multimedia (ICT) Act that would streamline and regulate ICT development. Regulatory bodies like the BTA and DIT could be merged taking stock of the strong and undivided relationship between the country's telecommunications systems and Information and communications technologies.

CHAPTER 19 RECOMMENDATIONS

The study of ICT development in Bhutan is a very broad subject. Studies in depth have been made to appreciate and deliberate on the plans, strategies and objectives of various agencies as far as ICT development and implementation are concerned. As a result of this, the following are recommended for the successful development of ICT and its promotion in Bhutan.

Sector level

Bhutan Telecom and Druknet

- Telephone and Internet charges have to be reduced to make it affordable to all sections of society
- Network bandwidth needs to be increased
- Appropriate technology has to be chosen for rural communications
- Bhutan Telecom may create a small community-training section to provide free training to students, youths, teachers and businessmen in all the regions. This training program can be extended to all sector officers in the district and community leaders in future

Education

- Enough computers have to be bought and supplied to all the high schools and institutions
- All high schools and institutions should have networks and Internet access
- Computer curriculum have to be introduced in teachers' training institutions, colleges and high schools
- An education Intranet needs to be established

Health

- All doctors and relevant health workers have to be trained in computer and Internet
- Health information website has to be developed and published
- Health department should implement telemedicine project at a low scale whereby it is cost effective and optimally useful

RNR

- RNR have to be trained on basic computers and Internet
- All district RNR officers needs to be trained on computers before implementing any ICT activities
- RNR sector should coordinate its ICT activities with Bhutan Telecom and Druknet to avoid unnecessary technical problems
- Appropriate and homogenous RNR application needs to be developed to facilitate smooth data transfers and retrievals
- All Research Centres needs to be interconnected through a web-based LAN/WAN

District Administrations

- All district sector heads should be supplied with computers and LANs should be established in all districts interconnecting sector offices, schools and hospitals in its vicinity

- A suitable computer application needs to be developed for use by district administrations and its networks

Private Sector

- Resources have to be mobilized to support the private sector in the use of computers and Internet
- Interested and able private sector enterprises should be identified and supported for software development and export
- Government should spearhead the use of e-commerce. Trade offices in Bhutanese foreign embassies need to be encouraged to market Bhutanese goods more aggressively through use of Internet
- Enough budgets have to be laid down for ICT training in the private sector
- Capacity of BCCI has to be strengthened to lead the private sector particularly in promoting e-commerce and e-business
- Regional Trade Points have to be established in the regional BCCI offices

Ministry level

- All Ministerial officers of all Ministries should be trained in computers and Internet
- The Bhutan Telecom Authority, BTA and the Department of Information Technology, DIT have to be merged as a single ICT regulatory authority
- The development of ICT is fragmented and uncoordinated. Therefore, appropriate agency has to be identified to spearhead ICT development in a coordinated manner
- All Ministerial ICT initiatives and activities have to be coordinated and implemented in close cooperation with relevant sectors particularly the telecom sector
- Any Ministerial ICT plans and strategies have to be developed by a group of technical and non-technical people, possibly involving engineers from Bhutan Telecom and Druknet and other ISPs that might come up in future
- The ICT Task Force has to be revitalized

National Level

- An ICT or Multimedia Act needs to be prepared and adopted
- Only one national agency has to be identified to guide the development of ICT in the country to avoid misunderstanding and finger pointing
- The training of community leaders and district officers has to be taken up at a national level with adequate resources and support
- Government should frame a separate ICT strategy targeted for the unemployed youths
- All ICT plans and policies of various sectors have to be reviewed and integrated. This should lead to the formation of an integrated National ICT plan
- Government should promote Community Telecentres at a National level.
- ICT plans of Donor agencies should be in tune with the National ICT Plans or Ministerial Plans

ANNEXURE A SAMPLE DRUKNET SURVEY ANSWER

Questionnaire

Name *(optional)*	Binai Lama	**Age**	31
Place	Mongar	**Earning per month** *(optional)*	Nu 8000.00

1	Do you own a computer? If 'not', why? No If 'No' a. Don't really need one
2	When did you subscribe to Druknet *(you may give month and year only)*? October 2000
3	What type of telephone connection do you use for Internet? *(You may delete others)* a. Same line as my phone
4	Do you use office or your personal account? Personal
5	Which packages of Druknet do you or your office use *(you may delete others)*? a. Internet lite
6	What is the average duration of your Internet usage? 10 hour
7	Why do you use Internet most of the time? *(As you may be using Internet for various purposes, we request you to write them down, eg. E-mails, news, information etc. etc.)* e-mail, surf professionally useful and technical sites, use for marketing of products, news and views, general knowledge, interesting software downloads
8	What do you think of the Druknet charges *(you may add additional comments if you want)*? a. Expensive Average of 25-30 hours under the internet lite package would be ideal to most subscribers
9	*Do you think establishment of Druknet has served its purpose of Information Technology (IT) for the overall development of the country?* (Additional comments will be appreciated) Without any doubt. Druknet has opened up the window of knowledge and the entrance to the outer world. The over all development of our country will definitely get a tremendous boost from the availability and existence of this facility. 30 years down the road, if we look back, we will see the difference then.

10	*The stakeholders in the establishment of Druknet were the Royal Government, IDRC (Canada) and the UNDP. Do you think, donors should continue financial support in the field of IT development in future?* Of course. IT development is the nucleus of all socio-economic development of any nation. However, a comprehensive and proper IT masterplan covering all aspects must be developed, before any random steps are undertaken.
11	Do you think Bhutan Telecom/Druknet is making enough effort to reach IT to all categories of the Bhutanese population? In your view, what more should they do? Well. There is always room for improvement. Druknet/BT in addition to being an ISP, should also be actively involved in extension activities. Druknet should have a broader interface with the general population.
12	*Have you personally benefited from Internet services in Bhutan? If so, please indicate in what ways have you benefited?* Internet services in Bhutan have been nothing short of a much-awaited Blessing. The internet has brought the whole knowledge pool of this universe into my tiny room, where I gain useful insights every progressive day. Besides, e-mail and other communication facilities have brought wonderful positive changes in the establishment and nurture of friendship and inter personal relationship.
13	*Kindly explain how effective has Internet been in your line of work or business?* *Examples*: I have saved costs of communications in my business, My students used Internet for the first time, My work has become very efficient as I can get lots of useful information through Internet etc. etc... Absolutely great. I can access vast amount of literature, publications, literary works, etc very easily. It is useful since we do not have access to literary resource, nor can we just walk down the block to buy a required publication. Besides, access to any information, news and views at the click of the mouse button cannot be described as less than the fulfillment of a magical wish.
14	*Besides efficiency and speed, in what other ways have you benefited from Internet services by Druknet?* For a comparatively new ISP Druknet has started well, on a positive footing. We, as a people, have benefited from this internet services. We could definitely move forward with the help of this technology and realize most of the dreams dreamt by our ancestors.
15	*If there is another ISP with the same charge for Internet, will you change your ISP or continue subscription with Druknet?* Older the better. (However, the keywords are efficiency and effectiveness)

16	(a) In terms of **technical support**, how do you rate Druknet Services? *(you may add additional comments)* a. Very good Druknet needs to have trained people and fast services in other places too (presently efficiency in the present context seems to be limited to Thimphu)
	(b) In terms of its **customer service and assistance**, how do you rate Druknet? *(you may add additional comments)* a. Very good
	(c) In terms of **connection speed and efficiency**, how do you rate Druknet Services? *(you may add additional comments)* a. Very good
	(d) In terms of **overall performance**, how do you rate Druknet Services? *(you may add additional comments)* a. Very good
17	*Do you think the reach of Internet to rural areas needs to be improved further?* Of course. In fact, as of now, there is hardly any service in the rural areas. There is sooooo much to be done in the rural areas, in terms of Internet and IT related services.
18	*Do you think more Bhutanese people or more of your friends will use Internet in the future? If, 'no' why?* There is going to be a solid increase. The main factors leading to it would be better and cheaper ISP, availability of cheaper (and non-taxed) computers, vigorous campaign and more training to people from all cross sections of the society on use & benefits of IT/internet services.
19	*Which sector do you think, Druknet should concentrate more?* Example: *Villages, Geogs, Dzongkhags, Urban Towns, etc. etc....* All. No one is less important than the other.
20	*In your view, do you think the framework of the 9th Five Year Plan should substantially incorporate IT, given the successful introduction and use of IT/Internet during the 8th Plan?* Yes. IT/Internet should be perceived as the path on which all socio-economic development programmes of the country will run on. The interpretation and correct use of IT/Internet services will definitely prevent an intellectually young society like ours to try to re-invent the wheel, and thereby waste valuable and scarce energy, time and resources.

ANNEXURE B ON-LINE FEEDBACK ON DRUKNET CHARGE

New Topic | Go to Top | Go to Topic | Threaded View | Search Newer Topic | Older Topic

Why Internet expensive in Bhutan?

Author: sonamchogyel (---.gate.nec.co.jp)
Date: 09-13-01 04:53

Hello all Authors here,

Let us discuss on this topic "Why Internet is expensive in Bhutan?" I am expecting your opinion and suggestion for this.

The Internet Café in Bhutan is charging Nu.3/- per minute use, which comes to Nu.180/- per hour and if you subscribe from ISP(druknet) it is costing Nu.800/- per month for Night Package (i.e from 9pm to 6am). I don't know the rate for day use and online lease lines, may be unexpectedly high too.

Anyone of you can give the suggestion for this.

Sonam

Re: Why Internet expensive in Bhutan?

Author: lens (---.druknet.net.bt)
Date: 09-13-01 06:46

The cyber and internet cafes in and around Thimphu really do charge high prices to their users and customers.

The reasons for this high cost of IT and usage could be because of Druknet and its high charging Internet lines.

With the passing of Resolutions of the National Assembly and as submitted by the ex-head of the government, the sales and buying tax of computers and accessories are 0%. New and newer versions of computers (DELL Optiplex GX-150, 10-40 GB Capacities, 128 RAM...) are already available in the Peljorkhang Enterprises at costs as low as Nu.50 to 55,000/- to 'enable the people' to have easy access to IT.

This is an irony in itself...could people have access by a mere possession of computers? If the Internet Access and its Charge could remain as high as of now, people could not be able to have Internet Connection and its facilities. May be people will own computers, but they will have no Internet connection. With the present scale of salary of most of the civil servants, it would not be possible for many of us to own computers and have an internet access. And most of the people, usually 'high shots', use their organisational ID to log on to Druknet. And the Government pay for them. Civil servants at the

lower rung of the cadre will not be benifitted because of the lack of computers. Most often they are denied of this facilities...Some organisation are lucky to have Leased Line with unlimited and free internet connection, but the government is paying a huge lumpsum to druknet...

Should Druknet revise these charges and aquaint most of us to IT with reasonable pricings?

The high cost of Internet Charge will not enable most of us to have 'basic' internet connection and its related goodies...

I should be getting wrong...but correct me if i am wrong...

Tashi Delek...

ANNEXURE C SECTOR SURVEY QUESTIONNAIRE

Dzongkhag: **Sector:**

1. Do you think Internet has benefited the working and productivity in your line of work or in your sector in the Dzongkhag?
   1. Yes – very much
   2. Yes – to some extend
   3. No

2. What type of information technology (IT) services do you use?
   1. Telephone only
   2. Computer only
   3. Telephone and computer without internet
   4. Telephone and computer with connection to internet

3. Pertaining to the above question, what type of ownership do you have?
   1. Have my own telephone in office
   2. Have my own computer in office
   3. I share telephone with my office colleague
   4. I share computer with my office colleague
   5. I use telephone and internet services whenever and wherever they are available

4. Do you know how to use computer?
   1. Yes – little bit
   2. Yes – I am proficient in computer use
   3. No – I don't know anything about computers

5. If you do not have telephone or computer in your office, what could be the reason?
   1. Not enough budget
   2. No stable power supply for computer
   3. Not required in my office
   4. Don't have because I do not know how to use

6. If there is a computer in your office, how was it bought?
   1. Bought through government budget
   2. Bought through project
   3. I use my own computer in office

7. Normally with whom do you talk from official telephone if you have one?
   1. With the headquarter officers
   2. With my colleagues in other dzongkhags
   3. With my colleagues in same dzongkhag
   4. With people outside Bhutan

8. When you make official calls, what types of topics do you normally discuss over telephone?
   1. Plans and policy matters
   2. Budget and Administrative matters
   3. Current work matters
   4. For advice and help in your field of work

9. If you use a computer, what do you use it for?
   1. To type letters
   2. To keep official records
   3. To use internet
   4. To learn computing
   5. Not applicable

10. Do you use computer to search for information from Internet?
   1. Yes
   2. No
   3. This question is not applicable

11. If '**yes**' to above what types of information do you read or download?
   1. My work related research information
   2. News on the subject of my work
   3. News and current affairs on Bhutan and world affairs

12. If you don't have, at what price do you think you can afford to buy a personal computer?
   1. Below Nu 10,000 *(computers are almost unavailable at this price)*
   2. Below Nu 20,000 *(very rare at this price)*
   3. Below Nu 30,000 *(now a days quite common to get at this price)*
   4. I have no price limit, as far as computer is of good brand

13. If you have computer/Internet in your office, do you think such facility should be extended to the field offices of your sector within the Dzongkhag as well?
   1. Yes
   2. No

14. Do you think it will be beneficial to use Internet and computers in the dzongkhag where you work?
   1. Yes – I completely agree
   2. Yes – To some extend it will be beneficial
   3. Yes – It will be beneficial but it is too early
   4. No – They will not benefit

15. If computers with local language texts like Dzongkha with training are provided, do you think people will use the computers in villages in your Dzongkhag?
   1. Yes
   2. No

16. Please feel free to add anything you would like to write on computers, telephone and Internet in relation to your sector in a separate sheet. You may also send us any project proposals on ICT in your sector where you might be requiring some funding.

ANNEXURE D COMPUTERS AND INTERNET INFORMATION

	Computer	Internet	Network	Internet	Number	Dialup	IT Staff	IT Unit	IT plans
Ministry of Trade and Industries	117	yes	yes	yes	10	yes			yes
Ministry of Finance	268	yes	yes	yes	263	yes	3	yes	yes
Ministry of Communications	10		no	yes	28	yes		no	no
Ministry ofAgriculture	240	yes	yes	yes	115		2	yes	yes
Royal Monetary Authority	30		yes	yes	2	yes	2	no	yes
Security Exchange	9	yes	yes	yes	1	yes		no	yes
Olympic Committee	7		no	yes	4	yes		no	yes
Ministry of Home Affairs	70	yes	yes	yes	31	yes		no	yes
Ministry of Health and Education	91		yes	yes	20	yes	4	no	yes
Thimphu Referral Hospital	56	yes	yes	yes	56		1	no	yes
Ministry of Foreign Affairs	43	yes	yes	yes	37		1	no	yes
National Assembly	11	yes	yes	yes	6	yes	1	no	yes
Cultural Affairs	18	yes	no	yes	3	yes	1	no	yes
Environment Commission	23	yes	no	yes				no	no
National Library	12	yes	yes	yes	1	yes		no	yes
Royal Institute of Management	95	yes	yes	yes	95		8	yes	yes
Royal Audit Authority	47	yes	yes	yes	10	yes	4	yes	yes
Civil Service Commission	32	yes	yes	yes	10	yes	3	yes	yes
Planning Commission	21		yes	yes	21		3	no	no
Tourism Department	10	yes	no	yes	2	yes			yes
Power Department	105	yes	yes	yes	17	yes			yes
National Institute of Education	33		no	yes	1	yes		no	yes
Teacher Training College	40	yes	yes	yes	5	yes	1	no	yes
Women's Association of Bhutan	2		no	no					no
High Court	27	yes	no	yes	2	yes	1	no	yes
District Administrations	127	yes	no	yes	27	yes	14	no	yes
Drukyel High School	10		no	no			3	no	yes
Khaling High School	16		no	no			2	no	yes
Rigney Institute	2		no	yes	1	yes			yes
National Driving Trg. Institute	2		no	no					yes
Royal Bhutan Polytechnic	55	yes	yes	yes	55	yes	2	no	yes
Royal Technical Institute	18	yes	no	yes	18	yes	3	no	yes
Yangchenphu School	13		no	yes	2	yes	3	no	yes
Technical Training Authority	12	yes	no	yes	5	yes			yes
Bhutan Dev. Finance Corporation	78	yes	yes	yes	8	yes	6	yes	yes
Bhutan Broadcasting	22	yes	yes	yes	22		3	no	yes
Bhutan Board Products	18	yes	yes	yes	2	yes	7	yes	yes
Bhutan National Bank	50	yes	yes	yes	10	yes	5	no	yes

Chukka Hydel	32	yes	no	yes	7	yes	32	no	yes
City Corporation	16		no	yes	1	yes			yes
BCCL Ltd.	33	yes	no	yes	10	yes	12	yes	yes
Bhutan Post,GPO	18		no	no					yes
Bhutan Telecom	110	yes	yes	yes	110	yes	25	no	yes
Druk Air Corporation	63	yes	yes	yes	12	yes	7	yes	yes
Kuensel Corporation	50	yes	yes	yes	30	yes	12	yes	yes
Insurance Office	108	yes	yes	yes	7	yes	10	yes	yes
State Trading	18	yes	yes	yes	3	yes	5	no	yes
Wood Craft Centre	5		yes	no				no	no
Bhutan Trust Fund	5	yes	yes	yes	4	yes		no	no
Chamber of Commerce	4		no	yes	1	yes		no	yes
Nature Protection office	10	yes	yes	yes	9	yes	1	no	yes
Digital Shangrila	10	yes	yes	yes	8	yes	4		yes
Info Tech Solutions	14	yes	yes	yes	6	yes	5	yes	yes
Ugen Trading House	4	yes	no	yes	9	yes	9	no	yes
VIT	16	yes	yes	yes	6	yes	3	yes	yes
Peljorkhang Ltd.	17	yes	yes	yes	17	yes	13	yes	yes

ANNEXURE E TELECOM NETWORK MAP

ANNEXURE F ACRONYMS

ACB	Austrian Cooperation Bureau
ADB	Asian Development Bank
AHED	Adult and Higher Education Division
APT	Asia-Pacific Telecommunity
BCCI	Bhutan Chamber of Commerce and Industries
BT	Bhutan Telecom
BTA	Bhutan Telecom Authority
CSC	Computer Support Centre
DANIDA	Danish Cooperation International Development Agency
DEL	Division of Employment and Labor
DIT	Division of Information Technology
DYT	Dzongkhag Yargay Tshogchung
GDP	Gross Domestic Product
GIS	Geographical Information System
GNH	Gross National Happiness
GYT	Geog Yargay Tshogchung
HRD	Human Resource Development
ICT	Information and Communications Technologies
ICTMP	ICT Master Plan
IDRC	International Development Research Centre
IFAD	International Fund for Agriculture Development
ITU	International Telecommunications Union
JICA	Japan International Cooperation Agency
LAN	Local Area Network
MCT	Multipurpose Community Telecentres
MEN	Ministry of Agriculture Enterprise Network
MOA	Ministry of Agriculture
MOC	Ministry of Communications
MTI	Ministry of Trade and Industries
NAGISC	National Geographic Information System Coordination
NEB	National Employment Board
NTTA	National Technical Training Authority
NWAB	National Women's Association of Bhutan
RGOB	Royal Government of Bhutan
RIM	Royal Institute of Management
RNR	Renewable Natural Resource
RNRRC	Renewable Natural Resource Research Centre
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
VOD	Video On Demand
WHO	World Heath Organization

ANNEXURE G GLOSSARY

Chhimi	Block Representative in National Assembly
Chipon	Village Messenger
Dratshang	Monk Organization
DYT	Dzongkhag Yargay Tshogchung (District Dev. Committee)
Dungkhang	Sub-district Administraiton
Dungpa	Sub-district Administrator
Dzongkhag	District
Dzongdag	District Administrator
Dzong	District Headquarter
Geog	Block (a group of villages)
Gup	Block Head
GYT	Geog Yargay Tshogchung (Block Development Committee)
Mangup	Vice-Block head
Tshogpa	Village Representative to GYT

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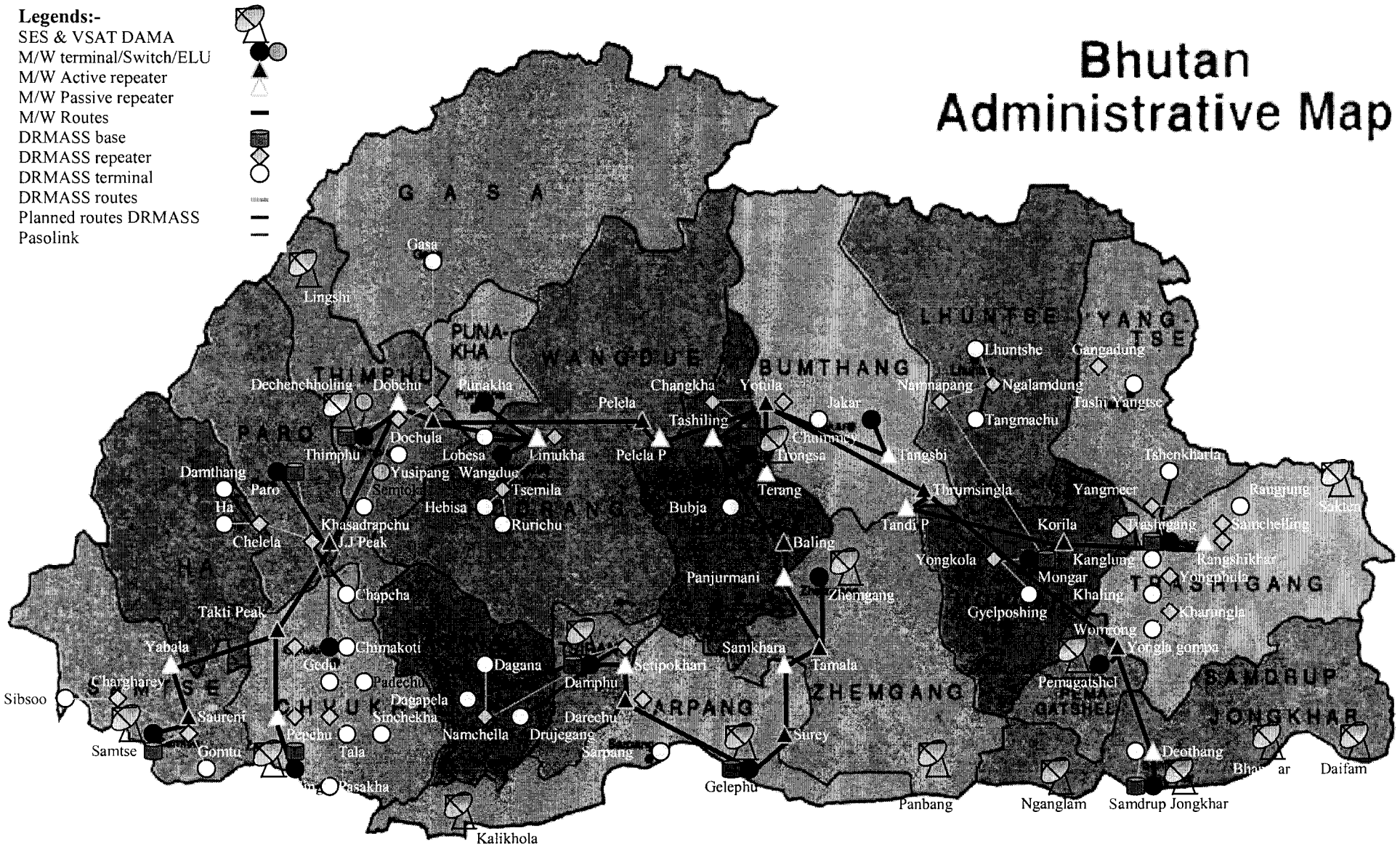

Annexure E – Telecom Network